C21_ Curriculum

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

OFFERED BY

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,

TELANGANA: HYDERABAD

IV SEMESTER

Sl No	Course Code	Course Name	Teaching Scheme				Credits	Examination Scheme						
			Instruction periods per week			Total Periods per semester		Continuous internal evaluation			Semester end examination			
			L	T	P			Mid Sem 1	Mid Sem 2	Internal evaluation	Max Marks	Min Marks	Total Marks	Min marks for Passing including internal
1	SC-401	Advanced Engineering Mathematics	4	1	0	75	3	20	20	20	40	14	100	35
2	EE-402	DC Machines and Batteries	4	1	0	75	3	20	20	20	40	14	100	35
3	EE-403	AC Machines	4	1	0	75	3	20	20	20	40	14	100	35
4	ME-414	Basic Mechanical Engineering	4	1	0	75	3	20	20	20	40	14	100	35
5	EE-405	Electrical Power Systems	4	1	0	75	3	20	20	20	40	14	100	35
6	EE-406	Electrical Engineering Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	EE-407	DC Machines Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	EE-408	Electrical CAD Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	EE-409	AC Machines Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	HU-410	Employability Skills Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11	EE-411	Skill Upgradation	0	0	8	120	2.5	0	0	Rubrics			--	-
	Activities: student performance is to be assessed through Rubrics													

SC-401 - ADVANCED ENGINEERING MATHEMATICS

Course Title	Advanced Engineering Mathematics	Course Code	SC-401
SEMESTER	IV	Course Group	Foundation
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites:

This course requires the knowledge of Engineering Mathematics at Diploma first year level and Applied Engineering Mathematics at Diploma 3rd Semester level.

Course Outcomes:

At the end of the course, the student will have the ability to:

CO 1	Solve simple Homogeneous Linear Differential Equations
CO 2	Solve simple Non-Homogeneous Linear Differential Equations and apply them in solving engineering problems.
CO 3	Express f(x) as a Fourier series in the given interval $(c\ ,\ c+2\pi)$
CO 4	Express f(x) as a Fourier Half-Range Cosine series and Sine series in (0, π)
CO 5	Find Laplace transforms of simple functions.
CO 6	Find Inverse Laplace transforms of simple functions and solve Linear Differential Equations using Laplace Transformations.

Course Contents:

Unit – I

Duration: 07 Periods (L: 5 – T: 2)

Homogeneous Linear Differential equations with constant coefficients

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Unit – II

Duration: 16 Periods (L: 13 – T: 3)

Non-Homogeneous Linear Differential equations with constant coefficients

Non-homogenous linear differential equations with constant coefficients of the form (D)y = X, where X is in the form k(a constant) e^{ax}, sin(ax), cos(ax), x^n, (n= 1,2,3) Complimentary Function (CF), Particular Integral (PI) and General Solution (GS).

Unit-III

Duration: 14 Periods (L: 11 – T: 3)

Fourier series

Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c\ ,\ c+2\pi)$, Euler's formulae, sufficient conditions for existence of Fourier series for a function f(x). Even, Odd functions and Fourier series over the Interval (0, 2π) and ($-\pi, \pi$)

Unit – IV

Duration: 08 Periods (L: 7 – T:1)

Fourier Half-range series

Representation of a function f(x) as a Fourier Half-range Sine series and Cosine series over the interval (0, π)

Unit – V

Duration: 14 Periods (L: 11 – T: 3)

Laplace Transformations:

Definition, sufficient conditions for existence of Laplace Transform, Laplace Transform of elementary functions, linearity property, Change of scale property, First shifting theorem , multiplication by t^n, division by t, Laplace Transform of derivatives and integrals, unit step function, Laplace Transform of second shifting theorem

Unit – VI

Duration: 16 Periods (L: 13 – T: 3)

Inverse Laplace transforms:

Inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s –Inverse Laplace Transform using partial fractions – convolution theorem (no proof) – application of Laplace Transformations to solve ordinary differential equations of second order with initial conditions.

Recommended Books:

1. Higher Engineering Mathematics, B.S. Grewal.
2. Laplace Transforms - Murray R. Spigel.
3. Ordinary Differential Equations – R. S. Aggarwal.
4. Fourier Series – A.R. Vasishtha and Gupta.

Suggested E-Learning references:

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html

2. E-books:www.mathebook.net

Suggested Learning Outcomes

At the end of the course, the student will have the ability to:

Unit-I

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

1.1 Solve Differential equations of the type $(aD^2 + bD + c)\ y = 0$ when the roots of the Auxiliary Equation (A.E) are real & different, real & repeated and complex.

1.2 Solve the higher order homogeneous linear differential equations with constant coefficients.

Unit-II

2.0 **Solve Non-Homogeneous linear differential equations with constant coefficients in engineering situations**

2.1 Apply the concept of complementary function, particular Integral to get general solution of a differential equation.

2.2 Solve n^{th} order differential equation of the type $f(D)\ y = X$ where $f(D)$ is a polynomial of second order and X is a function of the form k, e^{ax} ,$Sin(ax)$, $Cos(ax)$, x^n.

2.3 Solve simple problems on the above types of 2.2

Unit-III

3.0 Understand the Fourier series expansion of functions

3.1 Know the orthogonality of functions in an interval.

3.2 Identify Fourier series of a function in the interval (C, C+2π) and use the Euler's Formulae for determining the Fourier coefficients.

3.3 Write sufficient conditions for the existence of Fourier series for a function.

3.4 Expand Fourier series of simple functions in the range (0, 2π) and ($-\pi, \pi$).

3.5 Expand Fourier series for even and odd functions in the interval ($-\pi, \pi$)

3.6 Solve simple problems on even and odd functions in the interval. $(0,2\pi)$ and $(-\pi, \pi)$

Unit- IV

4.0 Understand the Half – Range Fourier series expansion of functions

4.1 Expand Half – Range Cosine series of a function in the range $(0\ , \pi)$.

4.2 Expand Half – Range Sine series of a function in the range $(0\ , \pi)$.

4.3 Solve simple problems on Half – Range Cosine and Sine series over the interval $(0, \pi)$

Unit-V

5.0 Understand Laplace transforms

5.1 Apply the definition of Laplace Transform and find Laplace transform of standard functions

5.2 Identify the sufficient conditions for existence of Laplace Transform.

5.3 Use the properties of Laplace Transform – Linearity property, First shifting theorem, Change of Scale property in solving simple problems.

5.4 Apply formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u)du$ in terms of Laplace transform of f (t) to solve simple problems

5.5 Identify unit step function and write the Laplace Transform of unit step function

5.6 Apply Second shifting theorem in solving simple problems.

Unit-VI

6.0 Use Laplace transforms and Inverse Laplace transforms to solve differential equation in engineering problems

6.1 Define inverse Laplace Transform and write inverse Laplace Transforms of standard functions.

6.2 Solve simple problems on Inverse Laplace Transforms.

6.3 Write Shifting theorems and Change of scale property of inverse Laplace Transform.

6.4 Solve simple problems on 6.2

6.5 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions $t^n f(t), \frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u)du$

6.6 Solve simple problems on 6.5

6.7 Define convolution of two functions and state convolution theorem.

6.8 Solve simple problems on Convolution theorem.

6.9 Use Laplace and inverse Laplace Transforms to solve simple differential equations of Second order.

Suggested Student Activities:

1. Student visits Library to refer Standard Books on Mathematics and collect related material.
2. Quiz
3. Group discussion
4. Surprise tests

5. Seminars
6. Home Assignments.
7. Mathematics for preparing competitive exams and solving old question papers on Arithmetical ability.

CO-PO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	Mapped POs
CO1	3	2					3	1,2, 7
CO2	3	2					3	1,2, 7
CO3	3	2					3	1,2, 7
CO4	3	2					3	1,2, 7
CO5	3	2					3	1,2, 7
CO6	3	2					3	1,2, 7

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

The length of answer for each question framed in respect of Part-A, B&C shall not exceed ¼ of a page,1page and 2 pages respectively

<table>
<tr><td rowspan="2">Unit No</td><td colspan="4">Questions to be set for SEE</td></tr>
<tr><td colspan="3">R</td><td>U</td><td>A</td></tr>
<tr><td>I</td><td rowspan="6">Q4</td><td colspan="2" rowspan="2">Q1</td><td rowspan="2">Q9(a)</td><td rowspan="2">Q13(a)</td></tr>
<tr><td>II</td></tr>
<tr><td>III</td><td colspan="2" rowspan="2">Q2</td><td rowspan="2">Q10(a)</td><td rowspan="2">Q14(a)</td></tr>
<tr><td>IV</td></tr>
<tr><td>V</td><td rowspan="2">Q3</td><td>Q5,Q6</td><td>Q9(b),
Q11(a), Q11(b)</td><td>Q13(b),
Q15(a), Q15(b)</td></tr>
<tr><td>VI</td><td>Q7,Q8</td><td>Q10(b),
Q12(a), Q12(b)</td><td>Q14(b),
Q16(a), Q16(b)</td></tr>
<tr><td>Total Questions</td><td colspan="3">8</td><td>8</td><td>8</td></tr>
</table>

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM –I, IV SEMESTER
SC-401- ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hour **Max. Marks: 20**

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04
2 Each question carries **ONE** mark

1. Write the General solution of $(aD^2+bD+c)\ y = 0$, whose roots of auxiliary equation are real and distinct.
2. Find the roots of auxiliary equation of the differential equation $(D^2 + 2D + 1)y = 0$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^{8x}$
4. Find the P.I of $(D^2 - 9)y = cos3x$

PART-B

Instructions: 1. Answer **ALL** questions 02 X 03 = 06

2. Each question carries **THREE** marks

5 a) Solve $(D^2 + 4D + 13)\ y = 0$

OR

5 b) Solve $(D^2 +16)\ y = 0$

6 a) Solve $(D^2 + 4D + 4)y = 5 + e^{-2x}$

OR

6 b) Find P.I of $(D^3 + D)y = \sin 2x$

PART- C

Instructions: 1. Answer **ALL** questions 02 X 05 = 10

2. Each question carries **FIVE** marks

7 a) Solve $(D^3 – 2D^2 – 4D + 8)\ y = 0$

OR

7 b) Solve $(D^3 – 6D^2 +11\ D – 6)\ y = 0$

8 a) Solve $(D^2 + 36)y = sin^2x$

OR

8 b) Solve : $(D^2 - 3D + 2)y = x + x^2$

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM –II, IV SEMESTER
SC-401- ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hour **Max. Marks: 20**

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04

2 Each question carries **ONE** mark

1. Define periodic function and give one example
2. Define Fourier series of the function f(x) in the interval $(0, 2\pi)$
3. Write Half-range sine series of f(x) in the interval $(0,\pi)$
4. Find a_0 for f(x) $=e^x$ in $0< x < \pi$

PART-B

Instructions: 1. Answer **ALL** questions 02 X 03 = 06

2. Each question carries **THREE** marks

5 a) If f(x) = x^2 in $(0, 2\pi)$, then find the value of a_n in Fourier series of f(x)

OR

5 b) If f(x) =$|x|$ in $(-\pi, \pi)$, then find the value of a_1 in Fourier series of f(x)

6 a).Find the value of a_n in half-range Cosine series for the function f(x) = e^x in $(0,\pi)$

OR

6 b) Obtain the Fourier Half – Range Sine series for f(x) = $(\pi - x) in the interval\ (0, \pi)$

PART- C

Instructions: 1. Answer **ALL** questions 02 X 05 = 10

2. Each question carries **FIVE** marks

7 a) Obtain the Fourier series for f(x) = x in the interval $0< x < 2\pi$

OR

7 b) Find the Fourier series for f(x) = $(x - x^2)$ in the interval $(-\pi, \pi)$. Hence show that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots\ldots\ldots + = \frac{\pi^2}{12}$$

8 a) Express f(x) = π x – x^2 as a half-range Sine series in $(0,\pi)$

OR

8 b) Find the half –range cosine series for the function f(x) =x^2 in the interval $(0,\pi)$

BOARD DIPLOMA EXAMINATION, (C-21)
IV SEMESTER END EXAMINATION
SC-401- ADVANCED ENGINEERING MATHEMATICS

Time: 2 hours **[Total Marks: 40]**

PART-A

Instructions: 1. Answer **ALL** questions 08 X 01 = 08

2 Each question carries **ONE** mark

1. Find the roots of auxiliary equation of the differential equation $(D^2 + 4D)y = 0$.
2. Define Fourier Series for the function f(x) in the interval (c, c+2π)
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^x$
4. Find $L(e^{2t} + Cos3t)$
5. Find $L(t + 5Cosht)$
6. State the First Shifting theorem of Laplace Transforms.
7. Find $L^{-1}\left(\frac{1}{s-3} + \frac{s}{s^2+4}\right)$
8. Find $L^{-1}\left(\frac{1}{2s+5}\right)$

PART-B

Instructions: 1. Answer **ALL** questions 04 X 03 = 12

2. Each question carries **THREE** marks

9a) Solve $(D^2+D + 1)\ y = 4e^{3x}$

OR

9 b) Find $L(tCos3t)$

10 a) Find Half Range Sine Series of f(x) = x in $(0\ ,\pi)$

OR

10 b) Find $L^{-1}\left(\frac{s+1}{s^2+6s-7}\right)$

11 a) If L{f(t)} = $\frac{20-4s}{s^2-4s+20}$, find L{f(3t)}

OR

11 b) Find $\int_0^\infty t.e^{-2t}Sin3tdt$ using Laplace Transform Technique

12 a) Show that $L^{-1}\left(\frac{1}{s(s^2+a^2)}\right) = \frac{1-\cos at}{a^2}$

OR

12 b) Find $L^{-1}\left(\frac{s}{(s+2)^2+4}\right)$

PART- C

Instructions: 1. Answer **ALL** questions 04 X 05 = 20

2. Each question carries **FIVE** marks

13 a) Solve: $(D^2 + D - 2)\, y = x + \sin x$

OR

13 b) Find $L[te^t sin3t]$

14 a) Expand $f(x) = x^2$ as a Fourier series in the interval $(-\pi, \pi)$

OR

14 b) Find $L^{-1}\left(\frac{s}{(s+1)^2(s^2+1)}\right)$

15 a) Find $L\left(\frac{Sin3t.Cost}{t}\right)$

OR

15 b) Evaluate $L\left\{\int_0^t \frac{\sin t}{t}\, dt\right\}$

16 a) Find $L^{-1}\left(\frac{1}{(s+1)(s+2)}\right)$ using Convolution theorem.

OR

16 b) Solve the differential equation $y'' - 2y' - 8y = \sin t$, when $y(0) = 3$, $y'(0) = 6$ by Laplace Transform method.

EE-402-DC MACHINES AND BATTERIES

Course Title	DC Machines and Batteries	Course Code	EE-402
SEMESTER	IV	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the knowledge of basic principles of electricity and magnetism.

Course Outcomes

At the end of the course, the student will have the ability to:

CO 1	Describe the construction and working of D.C Generator
CO 2	Compare the performance characteristics of D.C Generators
CO 3	Explain the principle and performance of D.C Motors
CO 4	Compare the performance characteristics of D.C Motors
CO 5	Apply different methods to control speed, testing and braking of D.C Motor
CO 6	Compare different types of Batteries

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R			U	A
1	Fundamentals of D.C Generators	14	Q4	Q1		Q9(a)	Q13(a)
2	Armature Reaction and Characteristics of D.C Generator	11					
3	Fundamentals of D.C Motors	15		Q2		Q10(a)	Q14(a)
4	Starters, Characteristics and Applications of D.C Motors	10					
5	Speed control, Testing and Braking of D.C Motors	15		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Batteries	10			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		75	8			8	8

Course Contents

UNIT 1- Fundamentals of D.C Generators

Duration: 14 Periods (L: 11 - T: 3)

Dynamically induced E.M.F- Fleming's right hand rule - electromechanical energy conversion - working principle of D.C generator - simple loop generator – construction and functions of each part of D.C generator with neat sketches - Lap and Wave windings – - E.M.F equation -Classification of generators based on excitation- Voltage and Current equations of different types of D.C Generators with schematic diagrams– power stages of DC generator - losses in D.C machines-efficiency –condition for maximum efficiency - simple problems

UNIT 2 - Armature Reaction and Characteristics of D.C Generator

Duration: 11 Periods (L:9 - T: 2)

Armature reaction, Demagnetization & Cross magnetization-Derivation for AT_d per pole and, ATc per pole- simple problems-commutation –methods of improving commutation-O.C.C, internal, external characteristics of Separately excited, Shunt, Series and Compound generators- Conditions for building up of EMF – reasons for not building up of E.M.F. - Critical field resistance and critical speed from O.C.C - parallel operation of generators - Applications of D.C generators – Welding Generator.

UNIT 3– Fundamentals of D.C Motors

Duration: 15 Periods (L:12 - T:3)

Fleming's left hand rule - working of D.C motors – significance of back E.M.F.-classification of DC motors- Connection diagrams, voltage and current equations for different D.C motors-Problems – Torque equation-Armature torque (T_a) , shaft torque (T_{sh}) and loss torque(T_L)–Problems on Torque- Different losses-power stages-efficiency-Problems on losses and efficiency.

UNIT4 : Starters, Characteristics and Applications of D.C Motors

Duration: 10 Periods (L: 8– T:2)

Necessity of starter- 3-point starter, 4-point starter. Electrical and mechanical characteristics of D.C Shunt, Series and compound motors-Applications of D.C motors

UNIT 5 : Speed control ,Testing and braking of D.C Motors

Duration: 15 Periods (L: 12 – T:3)

Necessity of speed control- Speed controls for D.C shunt motors (flux control, armature voltage control and voltage control methods) - advantages and disadvantages -methods of speed control for DC series motors- problems. Brake test on D.C. Motors- Performance curves- Swinburne's Test-advantages and disadvantages- problems. Types of braking –

Advantages of Electrical braking- methods of Electrical braking- Plugging, Rheostatic braking and Regenerative braking applied to DC shunt and DCseries motors- simple problems on plugging and rheostatic braking

UNIT 6 : Batteries

Duration:10 Periods (L:8 T:2)

Classification of cells - primary cells and secondary cells - construction of Lead acid cell - chemical reaction during charging and discharging of lead acid cell - applications - charging of Batteries – precautions during charging and discharging - trickle charging - indications of fully charged battery - capacity of a battery - factors affecting the capacity of the battery - Ampere-Hour efficiency - Watt- Hour efficiency - problems - flat plate battery - tubular battery - applications - Lithium-ion cell- applications - super capacitor - applications - metal air electrochemical cell – refuelable battery - applications - maintenance free battery – applications - methods of disposing batteries.

Recommended Books

1. Electrical Technology by H.Cotton
2. Electrical Technology –Vol –I by B.L.Theraja.
3. Electrical Technology –Vol –II by B.L.Theraja.
4. Electrical Machines by P.S.Bhimbhra
5. Electrical Machines by M.V.Deshpande
6. Electrical Machines by JB Gupta

Suggested E-learning references

1. http://electrical4u.com/
2. https://nptel.ac.in/syllabus/108106070/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/
4. https://nptel.ac.in/courses/108108076/
5. https://nptel.ac.in/courses/108105053/

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

1.1 Define dynamically induced E.M.F.

1.2 State Fleming's right hand rule.

1.3 Define Electromechanical energy conversion.

1.4 State principle of working of D.C generator.

1.5 Explain the working of simple loop generator.

1.6 Describe the construction of DC generator

1.7 State the functions of each part of D.C generator with neat sketches.

1.8 Describe the working of D.C Generator.

1.9 List the types of windings of D.C Machine (i) Lap (ii) Wave.

1.10 Compare lap winding and wave winding

1.11 Derive the E.M.F equation of D.C generator.

1.12 Solve simple problems on E.M.F equation.

1.13 Classify generators based on excitation.

1.14 Write voltage and current equations for different types of D.C Generators with schematic diagrams.

1.15 Explain power stages in D.C. machine

1.16 List the losses incurred in the D.C machines.

1.17 Define efficiency of DC Generator

1.18 Derive the condition for maximum efficiency.

1.19 Solve problems on losses and efficiency.

2.1. Define armature reaction.
2.2. Describe the armature reaction with sketches.
2.3. Describe the phenomenon of demagnetization &cross magnetization.
2.4. Derive the formula for ATd ,ATc / Pole.
2.5. Solve simple problems on ATd , ATc / Pole .
2.6. Define Commutation.
2.7. List the methods to improve commutation.
2.8. Draw and explain O.C.C, internal and external characteristics of Separately excited generator
2.9. Draw and explain O.C.C, internal and external characteristics of Shunt generator.
2.10. Draw and explain O.C.C, internal and external characteristics of Series generator
2.11. Draw and explain O.C.C, internal and external characteristics of Compound generators.
2.12. List the conditions for building up of EMF and reasons for not building up of E.M.F in DC generators.
2.13. Define critical field resistance and critical speed from O.C.C
2.14. Explain the necessity of parallel operation of DC generators.
2.15. List the conditions for parallel operation of generators.
2.16. State the use of equalizer ring in parallel operation.
2.17. List the applications of D.C generators.
2.18. Describe the working of welding generator with a sketch.

3.1 State Fleming's left hand rule.
3.2 Describe the working of D.C motors
3.3 Write the significance of back E.M.F and its formula.

3.4 Classify D.C motors.
3.5 Write voltage and current equations for different D.C motors.
3.6 Solve problems on back E.M.F
3.7 Derive torque equation of D.C motor.
3.8 Develop the formulas for armature torque (Ta), shaft torque (Tsh) and loss torque(TL).
3.9 Solve problems on torque.
3.10 Explain power stages in D.C. motor.
3.11 List the different losses in D.C motor.
3.12 Define efficiency of D.C motor
3.13 Solve problems on losses and efficiency.

4.1. State the necessity of starter.
4.2. Describe the construction and working of 3-point starter with neat sketch.
4.3. Describe the construction and working of 4-point starter with neat sketch.
4.4. Draw and explain the electrical characteristics of D.C Shunt motor.
4.5. Draw and explain the mechanical characteristics of D.C Shunt motor
4.6. Draw and explain the electrical characteristics of D.C Series motor.
4.7. Draw and explain the mechanical characteristics of D.C Series motor
4.8. Draw and explain the electrical characteristics of D.C compound motor (cumulative and differential compound) .
4.9. Draw and explain the mechanical characteristics of D.C compound motor (cumulative and differential compound).
4.10. List the applications of D.C motors

5.1 State the need of speed control of DC Motors.
5.2 List the different methods of speed controls for D.C shunt motors.
5.3 Describe the speed control of D.C shunt motor by flux control method
5.4 Describe the speed control of D.C shunt motor by armature control method
5.5 Describe the speed control of D.C shunt motor by voltage control method
5.6 List the advantages and disadvantages of various speed control methods of D.C Shunt Motor.
5.7 Solve problems on speed control of DC shunt motor
5.8 List the different methods of speed control for D.C series motors.
5.9 Describe the speed control methods of D.C series motor.
5.10 List the advantages and disadvantages of speed control methods of D.C series motor.
5.11 Solve problems on speed control of DC series motor
5.12 Describe the method of conducting brake test on D.C shunt motor with neat sketch
5.13 Describe the method of conducting brake test on D.C series motor with neat sketch
5.14 Describe the method of conducting brake test on D.C compound motor with neat sketch
5.15 Explain different performance curves.
5.16 List the advantages and disadvantages of brake test on different types of D.C Motors.
5.17 Solve problems on brake test on different types of D.C Motors.

5.18 Describe the method of conducting Swinburne's test.
5.19 Solve problems on Swinburne's test
5.20 List the advantages and disadvantages of Swinburne's test.
5.21 State the necessity of braking
5.22 List the types of braking
5.23 State the advantages of electrical braking
5.24 List the types of electrical braking
5.25 Explain plugging in DC shunt motor and DC series motor
5.26 Solve simple problems
5.27 Explain rheostatic or dynamic braking in DC shunt and series motor
5.28 Solve simple problems
5.29 Explain the concept of regenerative braking in DC shunt and DC series motor

6.1. Classify cells
6.2. Define primary cells and secondary cells
6.3. Compare primary and secondary cells
6.4. State types of storage cells
6.5. Describe the construction of Lead acid cell.
6.6. Write chemical reactions during charging and discharging of lead acid cell
6.7. List the applications of Lead acid cell
6.8. Describe charging of Batteries by a) Constant current method b) Constant voltage method
6.9. List the precautions during charging and discharging.
6.10. Define trickle charging
6.11. List the indications of full charged battery.
6.12. Define capacity of a battery
6.13. List the factors affecting the capacity of the battery
6.14. Define a) Ampere-Hour efficiency and b)Watt- Hour efficiency
6.15. Solve problems on the Ampere-Hour efficiency and Watt-Hour efficiency
6.16. Compare flat plate and tubular battery
6.17. List the applications of flat plate battery
6.18. List the applications of tubular battery
6.19. Describe the construction of Lithium-ion cell.
6.20. Write chemical reaction during charging and discharging of Lithium-ion battery
6.21. Give the applications of Lithium-ion cell
6.22. State the importance of super capacitor
6.23. List the applications of super capacitor

6.24. Describe the working of metal air electrochemical cell

6.25. List the applications of metal air battery

6.26. State the importance of refuelable battery

6.27. List the applications of refuelable battery

6.28. Define maintenance free battery.

6.29. List the applications of maintenance free batteries

6.30. List different methods of disposing batteries.

Suggested Student Activities

1. Prepare charts on types of starters used for various DC motors clearly labeling the parts.
2. Visit nearby shop or show room which sells batteries and inverters (UPS) and prepare a report on the observations made during visit.
3. Identify a faulty battery and service the same using standard tools.
4. Prepare a report of the conditions of batteries available in the Institute.
5. For given voltage, current, Ah ratings of individual cell, and required voltage and current rating of battery, prepare a report of calculations for number of cells and their method of connections.
6. Visit any industry and write a report on the DC machines used in that industry
7. Prepare a chart on DC motor speed control techniques
8. Make charts of various types of DC motors and generators, electrical equivalent circuit diagrams clearly indicating voltages and currents flowing in the machine. Also write the formulae of armature current, field current, line or load current, terminal voltage and back emf or induced emf
9. Quiz
10. Group discussion
11. Surprise test.

CO-PO Mapping Matrix

	Basic and discipline specific knowledge	Problem analysis	Design / development of solutions	Engineering Tools, Experimentation and Testing	Engineering practices for society sustainability and environment	Project Management	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	
CO1	3						3	1,7
CO2	3		1	1			3	1,3,4,7
CO3	3						3	1,7
CO4	3			1			3	1,4,7
CO5	3		1	2			3	1, 3,4,7
CO6	3			1	1		3	1,4,5,7

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

The length of answer for each question framed in respect of Part-A, B&C shall not exceed ¼ of a page,1 page and 2 pages respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

<table>
<tr><td rowspan="2">Unit No</td><td colspan="3">Questions to be set for SEE</td></tr>
<tr><td colspan="2">R</td><td>U</td><td>A</td></tr>
<tr><td>I</td><td rowspan="6">4</td><td rowspan="2">1</td><td rowspan="2">9(a)</td><td rowspan="2">13(a)</td></tr>
<tr><td>II</td></tr>
<tr><td>III</td><td rowspan="2">2</td><td rowspan="2">10(a)</td><td rowspan="2">14(a)</td></tr>
<tr><td>IV</td></tr>
<tr><td>V</td><td rowspan="2">3</td><td>5, 6</td><td>9(b),
11(a), 11(b)</td><td>13(b),
15(a), 15(b)</td></tr>
<tr><td>VI</td><td>7, 8</td><td>10(b),
12(a), 12(b)</td><td>14(b),
16(a), 16(b)</td></tr>
<tr><td>Total Questions</td><td colspan="2">8</td><td>8</td><td>8</td></tr>
</table>

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER MID SEMESTER-I EXAMINATION

Course Code: EE-402 **Duration:1 hour**
Course Name: DC Machines and Batteries **Max.Marks:20**

PART-A

Answer **all** questions, Each Question carries one-mark **4x1 = 4 Marks**

1. State the working principle of DC generator
2. State different parts in a DC generator
3. State the effects of armature reaction in a DC generator?
4. Define critical field resistance in DC generator.

PART-B

Answer two questions. Each question carries three marks **2x 3 = 6 Marks**

5 a) Draw the power flow diagram of a DC generator.

OR

b) Compare lap winding and wave winding in any three aspects.

6. a) List the conditions to be satisfied for parallel operation of dc generators?

OR

b) Define commutation and list the methods to improve it.

PART-C

Answer two questions. Each question carries five marks **2x 5 = 10 Marks**

7. a) A long shunt compound generator delivers a load current of 400A at a terminal voltage of 250V. The armature resistance, series field and shunt field resistances are 0.04 ohm, 0.01 ohm and 125 ohms respectively. Calculate the generated emf and armature current. Allow 1 V per brush contact drop.

OR

b) Derive the EMF equation of a DC Generator.

8. a) Explain the OCC of self-excited DC generator

OR

b) Describe the working of welding generator.

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER MID SEMESTER-II EXAMINATION

Course Code: EE-402 **Duration:1 hour**
Course Name: DC Machines and Batteries **Max.Marks:20**

PART-A

Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

1) State the types of DC motors
2) State the losses in DC motors
3) Draw the torque Vs armature current characteristics for a D.C shunt motor.
4) List any two applications of D.C shunt motor

PART-B

Answer **two** questions. Each question carries three marks **2x 3 = 6 Marks**

5. a) Write the significance of back E.M.F and its formula in DC motors

OR

b) Draw the circuit diagram of DC shunt motor and write the voltage and current equations.

6 a) Explain the necessity of starter in D.C Motors

OR

b) State the function of Hold on coil and over load release of a 3-point starter.

PART-C

Answer two questions. Each question carries five marks **2x 5 = 10 Marks**

7 a) Derive the torque equation of a D.C Motor

OR

b) A 440 V shunt motor has armature resistance of 0.8 ohm and field resistance of 200 ohms. Determine the back e.m.f when giving an output of 7.46 KW at 85% efficiency.

8. a) Draw 3 point starter and label the parts.

OR

b) Draw and explain the mechanical characteristics of D.C series motor.

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER
SEMESTER END EXAMINATION

Course Code: EE-402 **Duration:2 hours**
Course Name: DC Machines and Batteries **Max.Marks:40Marks**

PART-A

Answer **all** questions 8x1 =8 Marks

1) Define armature reaction.
2) State the types of DC motors.
3) State the method of speed control of DC shunt motor which gives below normal speed
4) State any two applications of DC series motor.
5) State any two factors affecting speed of a DC motor.
6) State the methods electrical braking.
7) List any two applications of Lithium- ion cell.
8) Define trickle charging.

PART-B

Answer **four** questions **4 x 3 = 12 Marks**

9. a) Draw the circuit diagram to conduct OCC of a DC separately excited generator and its characteristic curve.

OR

b) Draw the circuit diagram of speed control of DC shunt motor by field control method.

10. a) Draw Electrical and Mechanical characteristics of DC series motor.

OR

b) List any three applications of maintenance free batteries.

11. a) State any three advantages of Swinburne's test in DC motors

OR

b) State any three advantages of Electric Braking.

12. a) Compare Primary cells and secondary cells in any three aspects.

OR

b) List the indications of fully charged battery.

PART-C

Answer **four** questions 4 **x 5 = 20**

Marks

13. a) A 10KW, 250 V DC shunt generator has total iron and friction losses of 600W. Its armature and shunt field resistances are 0.5Ω and 125Ω respectively. Calculate efficiency at rated load.

OR

b) Explain the speed control of DC series motor by field diverter.

14. a) Draw the connection diagram of a 3 point starter and indicate the parts.

OR

b) Compare flat plate battery and tubular battery in any five aspects.

15. a) The following readings are obtained during the brake test of DC shunt motor.
Spring balance readings = 10 Kg and 35 Kg, Diameter of the drum = 40 cm
Speed of the motor = 950 rpm Applied voltage = 200 V Line current = 30 A
Calculate the output and efficiency.

OR

b) Explain the Plugging method of Electrical braking in DC shunt motor.

16.a) Explain the charging of a battery by constant voltage method.

OR

b) A lead acid cell is discharged at a steady current of 5A for 11 hours. The average terminal voltage being 1.8 V. To restore it to its original state of charge a current of 3A for 30 hours is required, the average terminal voltage being 2.2V. Calculate the ampere hour efficiency(AH) and watt hour efficiency(WH).

EE-403-AC MACHINES

Course Title	AC Machines	Course Code	EE-403
SEMESTER	IV	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of electromagnetic circuits, and physical forces induced in conductors.

Course Outcomes

CO1	Describe the construction and working of single phase transformer
CO2	Determine the Equivalent circuit parameters of a single phase transformer
CO3	Evaluate the performance of single phase transformers
CO4	Describe the construction of three phase transformers and their applications
CO5	Analyze the behavior of alternators
CO6	To be familiar with the working of alternators

Blue Print of Marks for SEE

<table>
<tr><th rowspan="2">Unit No</th><th rowspan="2">Unit Name</th><th rowspan="2">Periods</th><th colspan="4">Questions to be set for SEE</th></tr>
<tr><th colspan="2">R</th><th>U</th><th>A</th></tr>
<tr><td>1</td><td>Fundamentals of single phase transformers</td><td>10</td><td rowspan="6">Q4</td><td colspan="2">Q1</td><td>Q9(a)</td><td>Q13(a)</td></tr>
<tr><td>2</td><td>Tests on single phase transformers</td><td>15</td></tr>
<tr><td>3</td><td>Performance of single phase transformers</td><td>15</td><td colspan="2">Q2</td><td>Q10(a)</td><td>Q14(a)</td></tr>
<tr><td>4</td><td>Three phase transformers</td><td>10</td></tr>
<tr><td>5</td><td>Fundamentals of Alternators</td><td>15</td><td rowspan="2">Q3</td><td>Q5,Q6</td><td>Q9(b), Q11(a), Q11(b)</td><td>Q13(b), Q15(a), Q15(b)</td></tr>
<tr><td>6</td><td>Performance of alternators</td><td>10</td><td>Q7,Q8</td><td>Q10(b), Q12(a), Q12(b)</td><td>Q14(b), Q16(a), Q16(b)</td></tr>
<tr><td colspan="2">Total</td><td>75</td><td colspan="2">8</td><td>8</td><td>8</td></tr>
</table>

Course Content

UNIT 1 : Fundamentals of single phase Transform **Duration: 10 Periods (L: 8 - T: 2)**

Introduction to transformer-Classifications of transformers,-Construction of transformers-Theory of an ideal transformer –EMF equation derivation –Problems on calculation of EMF-Transformer ratio-Special transformers- expression for copper saving –applications

UNIT 2 :Tests on single phase transformers **Duration: 15 Periods (L:12 - T:3)**

Working of Transformer on no load – Vector Diagram –Working of Transformer on load – Vector Diagram-Equivalent circuit of transformer-Short circuit test-Open circuit test-Determination of Equivalent circuit parameters-Problems – Sumpner's test

UNIT 3 Performance of single phase transformers **Duration: 15 Periods (L: 12 - T: 3)**

Regulation-Derivation of approximate equation for regulation based on vector diagram for lagging, leading, unity power factor – Numerical problems on regulation-efficiency- condition for maximum efficiency – problems on efficiency- Calculation of all day efficiency for a given load cycle- problems on all day efficiency

UNIT 4 Three Phase Transformers **Duration: 10 Periods (L: 8 - T: 2)**

Three Phase Transformers-Construction-Different transformer configurations-Applications of different transformer configurations-parallel operation -Tap changing gear - NO load and ON load tap changing procedure- Applications of three phase transformers -Special purpose transformers – Gas Insulated Transformer –advantages, disadvantages and applications.

UNIT 5 Alternators **Duration: 15 Periods (L:10 - T: 5)**

Alternators –Types of alternators – Brief description of parts with sketches and function of each part, construction- Specifications-Assembly - Exciter and pilot exciter - Stationary armature type construction - Advantages, Concentrated and distributed windings - short pitch and full pitch coils - Effect of chording and distribution factors - EMF equation - Derivation – Problems- phasor diagram for unity, lagging and leading power factor loads –concept of powerformers – advantages, permanent magnet synchronous generator

UNIT 6 Performance of Alternators **Duration: 10 Periods (L: 8 – T: 2)**

Regulation – Different methods of finding regulation- Calculation of regulation by synchronous impedance method- Necessity for parallel operation –Condition to be fulfilled for Synchronization,-Synchronisation by lamp methods – Procedure to connect a Diesel Engine generator to the supply mains –Load sharing – simple problems-Effect of change in excitation and input of an alternator connected to infinite bus.

Recommended Books

1. B.L. Theraja-Electrical Technology – Vol –II S.Chand& Co.
2. M.G Say –AC machines
3. P.S. Bhimbra–Electrical machines – Khanna Publishers
4. A.E. Fritzgerald, C. Kingsley and S. Umans Electrical machinery-McGraw Hill
5. MV Deshpande-Electric machines – Wheeler publishing.
6. BR Gupta and VandanaSinghal– Fundamentals of Electric machines

Suggested E-Learning references

1. http://electrical4u.com/
2. www.nptel.ac.in
3. https://www.siemens.com/content/dam/internet/siemens-com/global/products-services

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

UNIT 1 : Fundamentals of single phase Transformer

1.1 Define the word 'Transformer'

1.2 Explain the working principle of single-phase transformer.

1.3 State the reason for not operating transformer on DC Supply

1.4 Classify the transformers based on Number of phases

1.5 Classify the transformers based on Construction

1.6 Classify the transformers based on Function

1.7 Explain the constructional details of transformers.

1.8 State the purpose and function of each part of the transformer with legible sketch.

1.9 Explain about core type transformer

1.10 Explain about the shell type transformer.

1.11 Distinguish between core type and shell type transformers.

1.12 Define an Ideal Transformer

1.13 Derive the E.M.F equation of a single phase transformer.

1.14 Solve problems on EMF equation

1.15 Define Turns Ratio of transformer

1.16 Define Voltage transformation Ratio of transformer

1.17 Define Current transformation Ratio of transformer

1.18 List the special transformers used in industry.

1.19 Define an Auto transformer

1.20 Derive the expression for saving of copper in auto transformer

1.21 State the advantages of autotransformers

1.22 State the disadvantages of autotransformers

1.23 List the applications of transformers

UNIT 2 :Tests on single phase transformers

2.1 Explain working of transformer at No-Load with the help of its vector diagram.

2.2 Explain working of transformer at Load with the help of vector diagram for Unity power factor

2.3 Explain working of transformer at Load with the help of vector diagram for Lagging power factor

2.4 Explain working of transformer at Load with the help of vector diagram for leading power factor

2.5 State the losses taking place in a transformer.

2.6 State the effects of resistance and leakage reactance of primary and secondary windings.

2.7 State the significance of air gap

2.8 Draw the equivalent circuit of a transformer by approximation

2.9 Explain the procedure to find equivalent circuit parameters from No-load test on single phase transformer

2.10 Explain the procedure to find equivalent circuit parameters from short circuit test on single phase transformer

2.11 Problems on the computing the equivalent circuit parameters of a single phase transformer

2.12 Explain the procedure of conducting polarity test on single-phase transformer.

2.13 Explain the procedure of conducting Sumpner's test on a transformer

2.14 State the necessity of break down voltage test on transformer oil

UNIT 3 Performance of single phase transformers

3.1. Define Regulation

3.2. Derive the approximate equation of regulation for transformer.

3.3. Solve the problems to calculate the regulation of a single phase transformer for loads with unity power factor
3.4. Solve the problems to calculate the regulation of a single phase transformer for loads with lagging power factor
3.5. Solve the problems to calculate the regulation of a single phase transformer for loads with leading power factor
3.6. State the reason for using the unit KVA for the transformer rating
3.7. Derive efficiency of a single phase transformer
3.8. Find the condition for maximum efficiency of a single phase transformer
3.9. Compute numerical problems for calculating the efficiency of the transformer
3.10. Define all day efficiency
3.11. Solve numerical problems for calculating all day efficiency
3.12. Define Distribution transformer
3.13. Define Power Transformer
3.14. Differentiate between distribution transformer and power transformer.
3.15. Mention the reasons for failures of a transformer
3.16. State the reasons for humming noise near a transformer and the methods to reduce the noise level.

UNIT 4 Three Phase Transformers

4.1. State the advantages of 3 phase transformer over single phase transformer
4.2. List the different types of three phase transformers by giving their symbolic representation and voltage relationships.
4.3. State the applications of star-star transformer
4.4. Mention the applications of delta-star transformers
4.5. List the applications of star-delta transformers
4.6. State the applications of delta-delta transformers
4.7. State the need for parallel operation of transformer.
4.8. Mention the specifications of a transformer
4.9. State the Benefits for use of amorphous core in a transformer
4.10. Mention the conditions for parallel operation and load sharing of transformers.
4.11. State the necessity of cooling of power transformers.
4.12. Explain the methods of cooling of power transformer.
4.13. Draw a legible sketch of a power transformer

4.14. Explain the function of each part of a power transformer.
4.15. Explain the ‘ON load’ and ‘OFF load’ tap changing.
4.16. Explain the procedure for tap changing on load and no load tap changer
4.17. Mention the purpose of application of a transformer as phase shifter
4.18. Mention the purpose of application of a transformer as HVDC Transformer
4.19. State the purpose of application of a transformer as traction transformer
4.20. Mention the purposed of Isolation transformers.
4.21. List the advantages of Gas Insulated Transformer.
4.22. List the disadvantages of Gas Insulated Transformer.
4.23. List the applications of Gas Insulated Transformer.

UNIT 5 Alternators

5.1. Explain the Principle of working of Alternators
5.2. Describe the constructional details of Alternators with legible sketch.
5.3. Classify the alternators based on rotor construction
5.4. Explain the construction and working of Cylindrical rotor alternator
5.5. Explain the construction and working of salient pole rotor alternator
5.6. State the specifications of an alternator
5.7. State the advantage of Stationary Armature.
5.8. List the main parts of alternator
5.9. Mention the materials used for different parts of an alternator
5.10. Derive the expression for Chording factor
5.11. State the effect of chording factor
5.12. Derive the expression for Distribution factor
5.13. State the effect of Distribution factor
5.14. Derive EMF equation of an alternator taking into account distribution factor and pitch factor.
5.15. Solve simple problems on EMF equation
5.16. State the need for an exciter in an Alternator.
5.17. List the various types of exciters
5.18. Explain armature reaction of Alternator at different power factors
5.19. State the reasons for voltage variations on Load.
5.20. Define the term synchronous impedance.

5.21. State the effects of synchronous impedance on the operation of the Alternator

5.22. Draw the equivalent circuit representing armature resistance, leakage reactance and armature reaction reactance

5.23. Obtain the relation between No load EMF and terminal voltage in Alternator.

5.24. Draw the vector diagram for No load EMF in alternator at different load power factors

5.25. State the concept of powerformers.

5.26. List the advantages of powerformers.

5.27. Describe the construction and working of permanent magnet synchronous generator

5.28. List the applications of permanent magnet synchronous generator

UNIT 6 Performance of Alternators

6.1. Define regulation of an alternator.

6.2. List the different methods of finding the regulation of alternator.

6.3. Calculate the regulation by synchronous impedance method.

6.4. State the expressions for No load e.m.f. of alternator at different powerfactors

6.5. Solve problems on Synchronous impedance method.

6.6. Explain the necessity for parallel operation of three phase alternators

6.7. State the conditions for synchronization for three phase alternators

6.8. Define synchronization of alternators

6.9. List the methods of synchronization of alternators

6.10. Explain the procedure for synchronization of alternators by using Dark and Bright lamp method

6.11. Explain the procedure for synchronization of alternators by using Synchroscope

6.12. Describe the procedure to connect a Diesel Engine generator to the supply mains

6.13. Explain the method for adjusting the loads shared by two alternators (or one alternator with Infinite bus bar).

6.14. Explain the effect of change in input and excitation of an alternator connected to infinite bus.

6.15. Solve problems on load sharing.

Suggested Student Activities

1 Prepare charts on types of transformers clearly labelling the parts.
2 Visit nearby transformer in your surroundings and prepare a report on the observations made during visit along with photos.
3 Visit the transformer manufacturing unit and prepare a report
4 Prepare a report on different transformers available in your Institute.
5 Do the maintenance of 50MVA transformer
6 Make charts of various transformer configurations
7 Quiz
8 Group discussion
9 Surprise test.

CO-PO Mapping Matrix

	Basic and Discipline Specific knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation & Testing	Engineering practices for society, sustainability and environment	Project Management	Lifelong learning	Linked PO
CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	
CO1	3	-	1	-	-	-	3	1, 3, 7
CO2	3	1	2	1	-	-	3	1, 2, 3,4,7
CO3	3	-	-	-	1	-	3	1, 5, 7
CO4	3	-	2	-	1	-	3	1, 3, 5,7
CO5	3	1	2	2	-	-	3	1 2,3,4,7
CO6	2	-	-	2	-	-	3	1,4,7

Continuous Internal Evaluation (CIE)

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed

¼ of a page side, 1 page side and 2page sides respectively.

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R			U	A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total Questions	8			8	8

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
SUB CODE: EE-403
AC MACHINES
MID SEM -I EXAM MODEL PAPER

TIME: 1 HOUR **TOTAL MARKS: 20**

PART – A **Marks: 4 X 1=4**

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Define Transformer.
2. Define Turns Ratio in transformer
3. Draw the vector diagram of a transformer on NO load
4. List the losses taking place in a transformer

PART - B **Marks: 2 x 3 = 6**

Instructions: (1) Answer the following questions.
(2) Each question carries **three** marks.

5. a) A single phase transformer has 400 turns on the primary winding and 1000 turns on the secondary winding if it is operating at 50Hz supply with a maximum flux of 0.045wb find (i) the primary and secondary induced emf

OR

5 b) What are the advantages of an Auto transformer

6. a) Draw the equivalent circuit of a transformer by approximation

OR

6 b) State the significance of airgap

PART - C **Marks: 2 x 5= 10**

Instructions: (1) Answer the following questions.
(2) Each question carries **five** marks.

7 a) Distinguish between core type and shell type transformers.

OR

7 b) Explain the function of each part of the transformer.

8 a) Explain working of transformer at Load with the help of vector diagram for Unity power

OR

8 b) The resistances and leakage reactance's of a 30 kVA, 2400 V/240 V distribution transformer are $R_1 = 0.68\ \Omega$; $R_2 = 0.0068\ \Omega$; $X_{l_1} = 7.8\ \Omega$; $X_{l_2} = 0.0780\ \Omega$; Where subscript 1 denotes the 2400 V winding and subscript 2 denotes the 240 V winding. Each quantity is referred to its own side of the transformer. Draw the equivalent circuit referred to High Voltage side

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
MID SEM –II EXAM MODEL PAPER

SUB CODE: EE-403 **SUBJECT NAME : AC MACHINES**

TIME: 1 HOUR **TOTAL MARKS: 20**

–

PART – A **Marks: 4 X 1=4**

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Define Regulation
2. Define All Day Efficiency
3. State the applications of star-star transformer
4. State the necessity of cooling of power transformers

PART - B **Marks: 2 x 3 = 6**

Instructions: (1) Answer the following questions.
(2) Each question carries **three** marks.

5 a) State the reason for using the unit KVA for the transformer rating

OR

5 b) State the reasons for humming noise near a transformer

6 a) State the advantages of 3 phase transformer over bank of three single phase transformers

OR

6 b) State the need for parallel operation of a transformer

.

PART - C **Marks: 2 x 5= 10**

Instructions: (1) Answer the following questions.
(2) Each question carries **five** marks.

7a) Differentiate between distribution transformer and power transformer.

OR

7 b) A 500KVA ,6000/400 V ,1-ϕ transformer has a primary and secondary winding resistances of 0.4Ω and 0.0015Ω respectively. The Iron losses are 3.2KW, Calculate the efficiency of transformer on full load assuming the p.f of the load to be 0.8 lagging

8 a) Explain the OFF load tap changing method on a transformer

OR

8 b) Explain the methods of cooling of power transformer.

EE-403

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA

SEMESTER END EXAM MODEL PAPER

SUB CODE: EE-403 **SUBJECT NAME: AC MACHINES**

TIME: 2 HOURS **TOTAL MARKS: 40**

PART – A

Instructions: (1) Answer all questions
(2) Each question carries **one** mark. **Marks: 8 X 1 = 8**

1. List the applications of transformers
2. Define Regulation
3. List the main parts of alternator

4. State the need for parallel operation of a transformer
5. State the specifications of an alternator
6. List the types of exciters
7. Define regulation of an alternator.

8. List the different methods of finding the regulation of alternator

PART - B

Instructions: (1) Answer the following questions
(2) Each question carries **three** marks. **Marks: 4 X 3 = 12**

9a) State the losses taking place in a transformer

OR

9b) Calculate the e.m.f induced per phase in a 3-ϕ ,8-pole ,50 Hz star connected alternator. The stator has 160 slots and 6 conductors per slot. Assume K_p=1 and K_d=0.96.The flux per pole is 0.16 wb

10a) State the advantages of three phase transformers over bank of three single phase transformers

OR

10b) Explain the effect of change in input and excitation of an alternator connected to infinite bus

11a) Classify the alternators based on rotor construction

OR

11b) State the advantage of Stationary Armature.

12a) State the conditions for synchronization for three phase alternator

OR

12 b) Explain the necessity for parallel operation of three phase alternators

PART - C

Instructions: (1) Answer the following questions
(2) Each question carries **five** marks.

Marks: 4 X 5 = 20

13a) Derive the E.M.F equation of a single phase transformer.

OR

13 b) Derive the expression for Chording factor

14 a) Explain the function of each part of a power transformer

OR

14b) Two alternators working in parallel have induced *emf's* on open circuit of $230\angle 0°$ and $230\angle 10°$ and having reactances of *j2* Ω and *j3* Ω respectively. Calculate

a. Terminal voltage
b. Power delivered by each of the alternators to a resistive load of 6 Ω.

Neglect alternator resistances

15a) Obtain the relation between No load EMF and terminal voltage in Alternator at leading power factor.

OR

15 b). Explain armature reaction of Alternator at different power factors

16a) Explain the procedure of synchronising of alternators by using synchroscope method

OR

16 b) A 200 kVA, 415 V, 50 Hz, 3-ø alternator has effective armature resistance of 0.01 Ω and an armature leakage reactance of 0.05 Ω. Compute the voltage induced in the armature winding when the alternator is delivering rated current at a load pf of 0.8 lag and 0.8 lead

ME-414-BASIC MECHANICAL ENGINEERING

Course Title	Basic Mechanical Engineering	Course Code	ME-414
SEMESTER	IV	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of basic sciences at secondary school level

Course Outcomes

CO1	Compute stress, strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section under the action of normal forces.
CO2	Design of shaft on the basis of strength and rigidity.
CO3	Explain the Construction and working of IC Engines.
CO4	Describe the working of Boilers
CO5	Describe the construction and working of Steam and Hydraulic turbines
CO6	Compare various types of Pumps and select a lubricant for specific application.

Blue Print of Marks for SEE

Unit No	**Unit Name**	**Periods**	**Questions to be set for SEE**				
			R			**U**	**A**
1	Simple Stresses & Strains	13	Q4	Q1		Q9(a)	Q13(a)
2	Torsion in Shafts	12					
3	I.C Engines	15		Q2		Q10(a)	Q14(a)
4	Boilers	10					
5	Turbines	12		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Pumps & Lubricants	13			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		75	8			8	8

COURSE CONTENT

UNIT-1 Simple Stresses & Strains

Duration: Periods 13(L: 10 – T:3)

Stress – strain - Poisson's ratio - elastic limit - statement of Hooke's law - stress-strain diagram with salient features for ductile materials under tensile stress - Elastic moduli - Young's modulus - Modulus of rigidity, - Bulk modulus - Working stress - Ultimate stress - Factor of safety-Related numerical problems.

UNIT-2 Torsion in Shafts

Duration: Periods 12(L: 10– T:2)

Classification of shafts - Function of shafts - Polar moment of inertia - Torsion equation- Maximum torque - Power transmitted by the shaft - Design of shaft based on strength and rigidity - Related numerical problems.

UNIT-3 I.C Engines

Duration: Periods 15 (L: 13 – T: 2)

Classification of heat engines and I.C engines –Construction of IC engines-Various parts of Petrol and Diesel engines- 2-stroke and 4- stroke engines-Comparison between 2-stroke and 4- stroke engines-Comparison between petrol and diesel engines - Functions of carburetor, fuel injection pump- Governing of I.C engines.

UNIT-4 Boilers

Duration: Periods 10 (L:8– T: 2)

Boilers - Classification of boilers –Fire tube and water tube boilers-Comparison between Fire tube and water tube boilers -Construction and working of Simple vertical, Cochran, Lancashire, Babcock and Wilcox, Lamont and Benson boilers- Different boiler mountings and accessories.

UNIT-5 Turbines

Duration: Periods 12(L: 10 – T: 2)

Steam turbine -Working principle of impulse and reaction steam turbines- Comparison between impulse and reaction turbines -Working principle of the De Level and Parson's reaction turbines - Classification of hydraulic turbines- Construction and working of Pelton wheel, Francis and Kaplan turbines-Comparison of different water turbines.

UNIT-6 Pumps& Lubricants

Duration: Periods 13 (L: 10– T: 3)

Hydraulic pumps – Classification –Construction and working of Reciprocating and Centrifugal pumps- Comparison between Reciprocating and Centrifugal pumps - Working principle of Jet and Submersible pumps -Lubricants - properties ,types, examples and their applications.

Recommended Books:

1. Strength of materials by Ramamrutham
2. Strength of materials by Surender Singh
3. Strength of materials by S.B.Junarker
4. General Mechanical Engineering by Lakshminarayana
5. Hydraulic Machinery by Jagadishalal
6. Strength of Materials,by .R.SKhurmi, S Chand and Co. Ltd.
7. Strength of Materials by R.K **Bansal,**Laxmi Publications
8. Fluid Mechanics by R.K Bansal, Laxmi Publications

SUGGESTED E-LEARNING REFERENCES

1. https://nptel.ac.in/courses/
2. https://en.wikipedia.org/wiki/Strength_of_materials
3. http://ndl.ethernet.edu.et/bitstream/

SUGGESTED STUDENT ACTIVITIES

1 Visit to nearby power plant station to identify different motors, pumps.
2 Visit nearby rice mill and identify different types of shafts used.
3 Study cut out models of IC Engines
4 Collect information on different lubricants used in Automobiles
5 Collect the information on different pumps used for various applications.

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. **Simple Stresses & Strains**

1.1. Define stress

1.2. Define strain

1.3. Mention the different types of stresses.

1.4. Mention the different types of strains.

1.5. State Hooke's law

1.6. Define Modulus of elasticity

1.7. Draw typical stress-strain curve for an M S Specimen under tension

1.8. Define factor of safety

1.9. Define Poisson's ratio

1.10. State the relationship between elastic constants.

1.11. Solve simple problems on Stress.

1.12. Solve simple problems on Strain.

1.13. Solve simple problems on Poisson's ratio.

1.14. Solve simple problems on calculation of the dimensional changes in the bodies of uniform cross section subjected to tensile and compressive forces.

2. **Torsion in Shafts**

2.1. State the function of shafts.

2.2. Classify shafts.

2.3. Specify the standard sizes of shafts.

2.4. Define Polar moment of inertia

2.5. Give the expression for Polar moment of inertia of solid shaft.

2.6. Give the expression for Polar moment of inertia of hollow shaft.

2.7. Explain the terms involved in simple torsion equation.

2.8. Maximum torque transmitted and power transmitted.

2.9. Design the size of solid shaft-Strength point of view and stiffness point of view

2.10. Simple problems.

3. **I.C Engines**

3.1. Define I.C. Engine.

3.2. Classify heat engines.

3.3. Mention types of I.C engines.

3.4. Explain the construction of I.C. Engines.

3.5. Identify the various parts of Diesel engine and Petrol engine.

3.6. Explain the principle of 4-stroke diesel engine.

3.7. Explain the principle of 4-stroke petrol engine.

3.8. Explain the principle of 2-stroke diesel engine.

3.9. Explain the principle of 2-stroke petrol engine.

3.10. Distinguish between 4-stroke cycle and 2-stroke cycles.

3.11. Distinguish between diesel engine and petrol engine.

3.12. State the function of carburettor.

3.13. State the functions of fuel pump.

3.14. State the functions of Governor.

4. **Boilers**

4.1. Explain the function of a boiler.

4.2. Classification of boilers.

4.3. Compare fire tube boiler with water tube boiler.

4.4. Explain construction and working principle of simple vertical boiler.

4.5. Describe construction and working principle of Cochran boiler.

4.6. Explain construction and working principle of Lancashire boiler.

4.7. Describe construction and working principle of Babcock and Wilcox boiler.

4.8. Explain construction and working principle of Benson boiler

4.9. Describe Lamont boiler with a neat sketch.

4.10. List different mountings of a boiler.

4.11. Mention the necessity of Water level indicator

4.12. Write the necessity of Pressure gauge.

4.13. State the necessity of Stop valve

4.14. Mention the necessity of Feed check valve.

4.15. Write the necessity of Safety valve.

4.16. State the necessity of Fusible plug.

4.17. Explain the working principle of Super heater.

5. **Turbines**

5.1. Define turbine.

5.2. Explain the principle of working of a steam turbine.

5.3. Classify the turbines based on action of steam.

5.4. Explain the working principle of steam impulse turbine

5.5. Explain the working principle of steam Reaction turbine

5.6. Compare impulse turbine with steam reaction turbine.

5.7. Describe the working principle of the De Level and Parson’s reaction turbines.

5.8. Classify the water turbines based on action of water.

5.9. Explain the construction and working of Pelton wheel.

5.10. Explain the construction and working of Francis turbine

5.11. Explain the construction and working of Kaplan turbine

5.12. Compare Pelton wheel, Francis and Kaplan turbines

6. **Pumps & Lubricants**

6.1. Define Pump

6.2. Explain the principle of operation of reciprocating pump.

6.3. Explain the constructional details of reciprocating pump.

6.4. Explain the principle of operation of centrifugal pump.

6.5. Explain the construction details of centrifugal pump.

6.6. Differences between a centrifugal pump and a reciprocating pump

6.7. Describe working principle and construction of double stage reciprocating pump.

6.8. Explain the principle of jet pump and submersible pump.

6.9. State the purpose of lubrication.

6.10. State the properties of a lubricant

6.11. List the types of lubricants with examples.

6.12. Mention the application of lubricants.

CO-PO Mapping Matrix

	Basic and Discipline Specific knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation & Testing	Engineering practices for society, sustainability and environment	Project Management	Lifelong learning	Linked PO
CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	
CO1	3	1	-	-	2	-	3	1,2,5,7
CO2	2	2	-	-	3	-	3	1,2,5,7
CO3	2	-	-	-	2	-	3	1,5,7
CO4	2	-	-	-	2	-	3	1,5,7
CO5	2	-	-	-	2	-	3	1,5,7
CO6	2	-	-	-	3	-	3	1,5,7

Continuous Internal Evaluation (CIE)

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed ¼ of a page side, 1 page side and 2page sides respectively.

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Blue Print of Marks for SEE

<table>
<tr><td rowspan="2">Unit No</td><td colspan="4">Questions to be set for SEE</td></tr>
<tr><td colspan="3">R</td><td>U</td><td>A</td></tr>
<tr><td>I</td><td rowspan="7">Q4</td><td colspan="2" rowspan="2">Q1</td><td rowspan="2">Q9(a)</td><td rowspan="2">Q13(a)</td></tr>
<tr><td>II</td></tr>
<tr><td>III</td><td colspan="2" rowspan="2">Q2</td><td rowspan="2">Q10(a)</td><td rowspan="2">Q14(a)</td></tr>
<tr><td>IV</td></tr>
<tr><td>V</td><td rowspan="2">Q3</td><td>Q5,Q6</td><td>Q9(b),
Q11(a), Q11(b)</td><td>Q13(b)
Q15(a), Q15(b)</td></tr>
<tr><td>VI</td><td>Q7,Q8</td><td>Q10(b),
Q12(a), Q12(b)</td><td>Q14(b)
Q16(a), Q16(b)</td></tr>
<tr><td>Total Questions</td><td colspan="3">8</td><td>8</td><td>8</td></tr>
</table>

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING,TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER MID SEMESTER-I EXAMINATION

Corse Code: ME-414 **Duration:1 hour**
Course Name: Basic Mechanical Engineering **Max.Marks:20**

PART-A

Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

1. State Hooke's law
2. Define Poisson's ratio
3. State the function of shafts
4. Give the expression for Polar moment of inertia of solid shaft

PART-B

Answer **two** questions. Each question carries three marks **2x 3 = 6 Marks**

5. a) Define factor of safety

OR

b) Define Modulus of elasticity

6. a) Classify shafts.

OR

b) Give the expression for Polar moment of inertia of hollow shaft.

PART-C

Answer two questions. Each question carries five marks **2x 5 = 10 Marks**

7. a) State the relationship between elastic constants

OR

b) Draw typical stress-strain curve for an M S Specimen under tension.

8. a) Explain the terms involved in simple torsion equation.

OR

b) Design the size of solid shaft from strength point of view.

State Board of Technical Education and Training, Telangana
Model Question paper
DEEE IV semester Mid Semester-II Examination

Corse Code:ME-414 **Duration:1 hour**
Course Name: Basic Mechanical Engineering **Max.Marks:20**

PART-A

Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

1. Define I.C. Engine
2. State the functions of fuel pump in an IC engine
3. State the necessity of boiler water level indicator
4. State the function of superheater

PART-B

Answer **two** questions. Each question carries three marks **2x 3 = 6 Marks**

5. a) Classify heat engine

OR

b) State the functions of carburetor in an IC engine

6. a) Classify boilers.

OR

b) Compare fire tube boilers and water tube boilers in any three aspects.

PART-C

Answer **two** questions. Each question carries five marks **2x 5 = 10 Marks**

7. a) Explain the construction of I.C. Engines

OR

b) Distinguish between diesel engine and petrol engine in any five aspects.

8. a) Explain the operation of Lamont boiler with a neat sketch.

OR

b) Explain the operation of Benson boiler with a neat sketch.

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER
SEMESTER END EXAMINATION

Corse Code: ME-414 **Duration:2 hours**
Course Name: Basic Mechanical Engineering
Max.Marks:40Marks

PART-A

Answer **all** questions 8**x1 =8 Marks**

1) State Hooke's law
2) State the function of economizer
3) State the purpose of lubrication
4) Define IC engine
5) Classify turbines based on action of steam
6) Classify water turbines
7) State the desirable properties of lubricants
8) List the types of lubricants

PART-B

Answer **four** questions **4 x 3 = 12 Marks**

9) a) Mention different types of stresses

OR

b) Compare impulse turbine and reaction turbine in any three aspects.

10 a) State the function of speed governor in an IC engine.

OR

b) List the applications of lubricants.

11 a) Compare impulse turbine and reaction turbine in any three aspects.

OR

b) State the working principle of steam turbine.

12 a) Classify hydraulic turbines.

OR

b) Compare centrifugal pump and reciprocating pump in any three aspects.

PART - C

Instructions: (1) Answer the following questions
(2) Each question carries **five** marks. **Marks: 4 X 5 = 20**

13 a) Draw typical stress-strain curve for an M S Specimen under tension

OR

b) Explain the working of Parson's reaction turbine with a neat sketch.

14 a) Explain the working of four stroke diesel engine with a neat sketch.

OR

b) Explain the principle of operation of centrifugal pump.

15 a) Explain the working principle of Pelton wheel

OR

b) Explain the working principle of Kaplan turbine

16 a) Explain the principle of operation of jet pump.

OR

b) Distinguish between a centrifugal pump and a reciprocating pump in any five aspects

EE-405-ELECTRICAL POWER SYSTEMS

Course Title	Electrical Power Systems	Course Code	EE-405
Semester	IV	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the knowledge of

(i) Basic principle and working of generator, transformers

(ii) Voltage and current calculations in the circuits using KCL,KVL

Course Outcomes

CO1 :	Explain various Energy sources & thermal power station.
CO2 :	Outline of construction and working of Hydroelectric power station and Nuclear Power station.
CO3 :	Examine various types of Transmission Systems.
CO4 :	Evaluate the performance of transmission lines
CO5 :	Explains of Line structures for Transmission and Distribution lines
CO6 :	Evaluate various aspects in Distribution systems.

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R			U	A
1	Sources of Energy &Thermal Power Station	10	Q4	Q1		Q9(a)	Q13(a)
2	Hydro Electric Power Station &Nuclear Power Station	15					
3	AC & DC Transmission systems	13		Q2		Q10(a)	Q14(a)
4	Performance of the transmission lines	12					
5	Line structures for Transmission and Distribution	15		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
6	Distribution systems	10			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		75	8			8	8

Course Content

UNIT 1 - Sources of Energy &Thermal Power Station

Duration: 10 Periods (L:8– T:2)

Different sources of energy - Need for Non-Conventional Energy based power generation – Methods of generation of energy from different sources of power- Merits and Limitations of Conventional and Non-conventional sources - Thermal Power Station - pulverization, Condensation – Types of cooling towers.

UNIT 2– Hydro Electric Power Station &Nuclear PowerStation

Duration: 15 Periods (L:12– T:3)

Hydro Electric Power Station - Factors for site selection and limitations in location – Hydrograph - Classification of hydroelectric power - Layout diagram of various Hydro Power Stations –Nuclear energy, fission and fusion reactions - Merits in using nuclear energy. Nuclear fuels - Working of moderator type nuclear power station with a block diagram - Materials used for coolant, reflector and control rods.

UNIT 3 –AC and DC Transmission systems

Duration:13 Periods(L:11 – T:2)

Transmission Lines- classification of Transmission systems - Relative advantages of AC & DC Transmission - Basic Concept of High voltage DC Transmission - Types of HVDC transmission- Advantages and disadvantages of HVDC transmission - Types of conductors – Current distortion effects.

UNIT 4 - Performance of the transmission lines

Duration: 12 Periods(L:10 – T:2)

Transmission line parameters – Expressions for Inductance of transmission system –Problems on computing Inductance - Expression for capacitance of a transmission system-Problems on computing capacitance –Classify transmission lines - Regulation of short transmission lines – Percentage regulation – Problems on computing Percentage regulation – Ferranti Effect – Corona.

UNIT 5 - Line structures for Transmission and Distribution

Duration:15 Periods(L:12 – T:3)

Components of Overhead lines – factors affecting conductors spacing and ground clearance - Sag-derivation- Factors affecting sag, Problems on calculating sag - Disadvantages of loose span – Insulators - Requirements of insulators - Types of Insulators – Advantages of Polymer insulators - Voltage distribution across string of suspension Insulators- string efficiency- Problems on string efficiency - Methods of improving string efficiency.

UNIT 6 – Distribution Systems

Duration:10 Periods (L:8 – T:2)

Definition of substation-need of substation- classification of sub-stations - Relative merits of indoor and outdoor sub-stations –Purpose of various equipment in sub-stations - Classification of Distribution systems - Steps in voltage drop calculation – problems – Micro Grid - Concept of smart GRID

Recommended Books

1. S.L.Uppal-Electrical Power
2. Soni,Guptha,Bhatnagar-Electrical Power Systems - DhanpatRai& Sons
3. A.T.Starr -Generation, Transmission and Utilisation
4. C.L.Wadhwa -Electrical Power Systems - New age international(P) limited
5. NEDCAP -Non Conventional Energy Guide Lines
6. J B Guptha -Electrical power plants
7. G.D. Roy Non conventional energy sources
8. CL Wadhwa -Electrical power Systems - New Age International(P) limited.
9. KR Padiyar - HVDC Power Transmission system Technology
10. S.N. Singh -Electrical Power generation, transmission and distribution.

Suggested E-Learning references

1. http://electrical4u.com/
2. www.nptel.ac.in
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

1.1 List different sources of energy

1.2 Classify the sources of energy into conventional and non-conventional types.

1.3 State the necessity of developing non-conventional methods of power generation.

1.4 State the relative merits and limitations of Conventional and Non-Conventional types of sources.

1.5 State the method of generating electrical energy from Solar Power

1.6 State the method of generating electrical energy from Tidal Power

1.7 State the method of generating electrical energy from Wind power

1.8 State the method of generating electrical energy from Biomass

1.9 State the method of generating electrical energy from Geo Thermal Power

1.10 State the working principle of thermal power stations.

1.11 List the requirements for setting up of Thermal Power Station.

1.12 Draw the detailed line diagram of a condensing type thermal power station.

1.13 Explain the principle of working of each component of thermal power station.

1.14 Define Pulverization.

1.15 Mention the advantages of Pulverization

1.16 Define Condensation.

1.17 Mention the advantages of Condensation

1.18 State the necessity of cooling towers in thermal power plant

1.19 List the types of cooling towers used in thermal power plants.

2.1 State the principle of working of Hydro power station.

2.2 Mention the requirement and factors for site selection of Hydro Electric Power station.

2.3 Define Hydrograph.

2.4 Classify the Hydro Electric Power stations based upon head.

2.5 Classify the Hydro Electric Power stations based upon duty

2.6 Classify the Hydro Electric Power stations based upon location

2.7 Classify the Hydro Electric Power stations based upon hydraulic considerations.

2.8 Explain the working of High Head Power Station with layout diagram.

2.9 Explain the working of Medium Head Power Station with layout diagram.

2.10 Explain the working of low Head Power Station with layout diagram.

2.11 State the need of Surge Tank.

2.12 State the need of Forebay.

2.13 State the need of Spill gates.

2.14 State the importance of nuclear energy.

2.15 Explain fission reaction.

2.16 Explain fusion reaction.

2.17 State the merits of using nuclear energy

2.18 Mention the various nuclear fuels used in nuclear power station.

2.19 Explain the working of a Nuclear power station with a block diagram.

2.20 State the materials used for coolant.

2.21 State the materials used for Reflector.

2.22 State the materials used for control rods.

3.1 State the need of transmission lines.

3.2 State the need of distribution lines.

3.3 Classify transmission systems.

3.4 State the advantages of D.C transmission systems.

3.5 State the advantages of A.C transmission systems.

3.6 State the advantages of extra high voltage transmission systems.

3.7 Explain the effects of Supply frequency on Transmission lines.

3.8 Explain the effects of Supply voltage on Transmission lines.

3.9 State the effect of voltage on Line efficiency

3.10 State the effect of voltage on Voltage drop.

3.11 State the effect of voltage on Line loss.

3.12 State the effect of voltage on Active & reactive Power.

3.13 State the effect of voltage on Volume of conductor material.

3.14 Explain the concept of HVDC transmission.

3.15 List the types of HVDC transmission.

3.16 List the advantages of HVDC transmission.

3.17 List the disadvantages of HVDC transmission.

3.18 Explain the different types of conductors used in transmission line.

3.19 List various Current distortion effects.

3.20 State Skin effect

3.21 State Proximity effect

3.22 State Spirality effect

4.1 List various transmission line parameters.

4.2 State the expression for inductance of 1 phase system (No Derivation)

4.3 Solve problems on inductance of 1 phase system

4.4 State the expression for the inductance of 3 phase symmetrical round conductor. (No Derivation)

4.5 Solve problems on the inductance of 3 phase symmetrical round conductor.

4.6 State the expression for the inductance of 3 phase asymmetrically spaced round Conductors (No derivation)

4.7 Solve problems on the inductance of 3 phase asymmetrically spaced round conductors

4.8 State the expression for capacitance of 1 phase system (No Derivation)

4.9 Solve problems on capacitance of 1 phase system

4.10 State the expression for the capacitance of 3 phase symmetrical round conductor. (No Derivation)

4.11 Solve problems on the capacitance of 3 phase symmetrical round conductor.

4.12 State the expression for the capacitance of 3 phase asymmetrically spaced round conductors (No derivation)

4.13 Solve problems on the capacitance of 3 phase asymmetrically spaced round conductors

4.14 Define Short transmission line.

4.15 Define Medium transmission line.

4.16 Define Long transmission line.

4.17 Define Regulation.

4.18 Define Percentage Regulation.

4.19 State the approximate formula for percentage regulation.(no derivation)

4.20 Compute the Sending end voltage for short transmission line

4.21 Compute the Sending end Power factor for short transmission line

4.22 Compute the Percentage Regulation for short transmission line

4.23 Draw the phasor diagram

4.24 State `Ferranti' effect

4.25 Define Corona

5.1 State the main components of overhead lines

5.2 State the factors on which the conductor spacing and ground clearance depend

5.3 Define `Sag'

5.4 State the factors affecting the sag

5.5 Derive an equation for the approximate method of calculating sag when the supports are at the same level in still air.

5.6 Derive an equation for the approximate method of calculating sag when the supports are at the same level with the effect of wind.

5.7 Derive an equation for the approximate method of calculating sag when the supports are at the same level with the effect of ice.

5.8 Solve the problems on calculating sag.

5.9 State the disadvantages of loose spans(sag more than prescribed value)

5.10 State the purpose of insulators in transmission and distribution lines

5.11 State the requirements of insulators.

5.12 List various types of Insulators.

5.13 State applications of the Pin type insulators.

5.14 State applications of the Strain type insulators.

5.15 State applications of the Suspension type insulators.

5.16 State applications of the Shackle type insulators.

5.17 Define a Polymer insulator.

5.18 State the advantages of Polymer insulators.

5.19 Derive the voltage across individual disc of a string insulator (upto 3 discs).

5.20 Solve problems on distribution of voltage across string

5.21 Define Flashover.

5.22 Define Puncture.

5.23 Define String-efficiency.

5.24 State the methods of improving string efficiency

6.1 State the need for substations.

6.2 State the relative merits of indoor substation, outdoor substation and Gas insulated Substations over others.

6.3 List the equipment used in substation.

6.4 State the purpose of the Bus bars.

6.5 State the purpose of the Transformers.

6.6 State the purpose of the Switch gear.

6.7 State the purpose of the Indicating and Metering equipment

6.8 State the purpose of the Protective relays

6.9 State the purpose of the Lightning arrestors

6.10 State the purpose of the Wave trap.

6.11 Distinguish between primary distribution and secondary distribution.

6.12 State the purpose of Feeder.

6.13 State the purpose of Distributors.

6.14 State the purpose of Service mains.

6.15 Classify the type of distribution systems according to Type of current.

6.16 Classify the type of distribution systems according to Construction.

6.17 Classify the type of distribution systems according to Service.

6.18 Classify the type of distribution systems according to Number of wires.

6.19 Classify the type of distribution systems according to Scheme of connections.

6.20 List the type of distribution systems.

6.21 State the advantages and disadvantages of Radial system

6.22 State the advantages and disadvantages of Ring main system.

6.23 List the steps to calculate the voltage drop in 1-phase A.C. distributors

6.24 Solve problems on voltage drop calculations in A.C. Distributors.

6.25 Solve problems on voltage drop calculations in D.C Distributors.

6.26 Define Micro Grid.

6.27 Explain the concept of smart grid

Suggested Student Activities

1. Student visits Library to refer to Electrical Manuals.
2. Student prepares the models of the power plants
3. Student visits Power generating stations familiarize with the equipment.
4. Visit Power nearby substations and gets familiar with the components.
5. Students may be asked to prepare model project of the power system.
6. Prepare charts on different Generating stations in our state mentioning their locations.
7. Gather information of HVDC transmission projects in India and prepare a report
8. Identify different insulators in your surroundings and prepare a report
9. Watch YouTube videos on SMART GRID and MICRO GRID and prepare a summary report
10. Group discussion.
11. Surprise tests and Quiz.

CO-PO Mapping Matrix

	Basic and Discipline Specific knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation & Testing	Engineering practices for society, sustainability and environment	Project Management	Lifelong learning	Linked PO
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	
CO1	3	3	3	1	3	3	3	PO1,2,3,4,5,7
CO2	3	3	3	1	3	3	3	PO1,2,3,4,5,7
CO3	3	3	2	2	3	3	3	PO1,2,3,4,5,7
CO4	3	3	2	2	3	3	3	PO1,2,3,4,5,7
CO5	3	3	2	3	3	3	3	PO1,2,3,4,5,7
CO6	3	3	3	3	3	3	3	PO1,2,3,4,5,7

Continuous Internal Evaluation (CIE)

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A
1	Unit-I	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-II	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

MID SEM-II EXAM

S.No	Unit No	R	U	A
1	Unit-III	1,2	5(a)	7(a)
			5(b)	7(b)
2	Unit-IV	3,4	6(a)	8(a)
			6(b)	8(b)
Total Questions		4	4	4

The length of answer for each question framed in respect of Part-A, B&C shall not exceed ¼ of a page side, 1 page side and 2page sides respectively.

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

<table>
<tr><td rowspan="2">Unit No</td><td colspan="4">Questions to be set for SEE</td></tr>
<tr><td colspan="3">R</td><td>U</td><td>A</td></tr>
<tr><td>I</td><td rowspan="7">Q4</td><td colspan="2" rowspan="2">Q1</td><td rowspan="2">Q9(a)</td><td rowspan="2">Q13(a)</td></tr>
<tr><td>II</td></tr>
<tr><td>III</td><td colspan="2" rowspan="2">Q2</td><td rowspan="2">Q10(a)</td><td rowspan="2">Q14(a)</td></tr>
<tr><td>IV</td></tr>
<tr><td>V</td><td rowspan="2">Q3</td><td>Q5,Q6</td><td>Q9(b),
Q11(a), Q11(b)</td><td>Q13(b),
Q15(a), Q15(b)</td></tr>
<tr><td>VI</td><td>Q7,Q8</td><td>Q10(b),
Q12(a), Q12(b)</td><td>Q14(b),
Q16(a), Q16(b)</td></tr>
<tr><td>Total Questions</td><td colspan="3">8</td><td>8</td><td>8</td></tr>
</table>

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
MID SEM -I EXAM MODEL PAPER

SUB CODE: EE-405 **TIME: 1 HOUR**
SUB NAME : ELECTRICAL POWER SYSTEMS **TOTAL MARKS: 20**

PART – A **Marks: 4 X 1=4**

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. List the various sources of Energy.
2. List the types of cooling towers used in Thermal power plant
3. Define Hydrograph
4. State the need of Spill gates

PART - B **Marks: 2 x 3 = 6**

Instructions: (1) Answer the following questions.
(2) Each question carries **three** marks.

5a) State the need of Non-conventional Energy Sources

OR

5b) What is Coal Pulverisation?

6 a) State the importance of nuclear energy

OR

6 b)Write the merits of Nuclear Energy.

PART - C **Marks: 2 x 5= 10**

Instructions: (1) Answer the following questions.
(2) Each question carries **five** marks.

7 a) Draw a single line diagram of a Thermal Power station

OR

7 b) State the relative merits and limitations of Conventional and Non-Conventional types of sources

8 a) Explain the principle of working of Hydro power station.

OR

8 b) Explain the working of High Head Power Station with layout diagram

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
MID SEM -II EXAM MODEL PAPER

SUB CODE: EE-405 **TIME: 1 HOUR**
SUB. NAME : ELECTRICAL POWER SYSTEMS **TOTAL MARKS: 20**

PART – A **Marks: 4 X 1=4**

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. State the need of transmission lines.
2. List the types of HVDC transmission
3. List various transmission line parameters
4. Define Medium transmission line

PART - B **Marks: 2 x 3 = 6**

Instructions: (1) Answer the following questions.
(2) Each question carries **three** marks.

5 a) State the advantages of Extra high voltage transmission systems.

OR

5 b) State Skin effect

6 a) State `Ferranti' effect

OR

6 b) Define Percentage Regulation.

PART - C **Marks: 2 x 5= 10**

Instructions: (1) Answer the following questions.
(2) Each question carries **five** marks.

7a) Explain the different types of conductors used in transmission line.

OR

7 b) Explain the concept of HVDC transmission.

8 a) A 3-phase overhead line conductors are arranged in a horizontal plane and are 3 m art. The diameter of each conductor is 1cm.Calculate the capacitance per km of each conductor

OR

8 b) A single phase transmission line has a resistance of 0.20 ohms and an inductive reactance of 0.40 ohm. Find the voltage at the sending end to give 500KVA at 2kV at the receiving end at load power factor of 0.707 lagging

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
END SEM EXAM MODEL PAPER

SUB CODE: EE-405 **TIME: 2 HOUR**
SUB. NAME : ELECTRICAL POWER SYSTEMS **TOTAL MARKS: 40**

PART – A

Instructions: (1) Answer all questions
(2) Each question carries **one** mark. **Marks: 8 X 1 = 8**

1. Define Hydrograph.
2. List the types of HVDC transmission.
3 .Define `sag'
4. List the transmission line parameters.
5. Define Flashover.
6. Define a Polymer insulator.
7. State the need for substations.
8. State the purpose of Feeder.

PART - B

Instructions: (1) Answer the following questions
(2) Each question carries **three** marks. **Marks: 4 X 3 = 12**

9a) State the relative merits and limitations of Conventional and Non-Conventional types of sources

OR

9 b) State the requirements of insulators

10a) State the expression for the inductance of 3 phase symmetrical round conductor.

OR

10b) State the purpose of the Lightning arrestors

11a) State the purpose of insulators in transmission and distribution lines

OR

11b) State the disadvantages of loose spans.

12 a) State the purpose of the Indicating and Metering equipment

OR

12 b) Distinguish between primary distribution and secondary distribution

PART - C

Instructions: (1) Answer the following questions
(2) Each question carries **five** marks.

Marks: 4 X 5 = 20

13a) Explain the principle of working of each component of thermal power station.

OR

13 (b) State the requirements of insulators and give the list of insulators

14 a) A single phase transmission line has a resistance of 0.20 ohms and an inductive reactance of 0.40 ohm. Find the voltage at the sending end to give 500KVA at 2kV at the receiving end at load power factor of 0.707 lagging

OR

14 b) Explain the concept of smart GRID

15a) Derive an equation for the approximate method of calculating sag when the supports are at the same level with the effect of ice

OR

15 b) An insulator string consists of 3 units each having a safe working voltage of 15kV. The ratio of self-capacitive to shunt capacitive of each unit is 8 1 : . Find the maximum safe working voltage of the string and string efficiency

16 a) Explain Feeder, distributors and service mains

OR

16 b) A single phase a.c distributor AB 300 meters long is fed from end A and is loaded as under (i) 100 Amps at 0.707 p.f lagging 200 meters from point A (ii) 200 amps at 0.8 p.f lagging 300 meters from point A. The total resistance and the reactance of the distributor is 0.2 ohms and 0.1 ohms per km respectively. Calculate the total voltage drop in the distributor. The load power factors refer to the voltage at the far end

EE-406-ELECTRICAL ENGINEERING DRAWING

Course Title	Electrical Engineering Drawing	Course Code	EE-406
Semester	IV	Course Group	Practical
Teaching Scheme in periods (L : T : P)	1:0:2	Credits	1.5
Methodology	Lecture + Tutorial	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Pre requisites

The student should have knowledge of Engineering Graphics.

Course Outcomes

CO1 :	Draw the views of symbols & fuses
CO2 :	Draw the sectional views of transformers
CO3 :	Draw the cross sectional view of underground cables
CO4 :	Develop DC & AC machine windings.
CO5 :	Draw the Single Line diagrams and layouts of industrial electrical installations
CO6 :	Draw Power system protection Equipment

Blue Print of Marks for SEE

<table>
<tr><th rowspan="2">Unit No</th><th rowspan="2">Unit Name</th><th rowspan="2">Periods</th><th colspan="3">Questions to be set for SEE</th></tr>
<tr><th>R</th><th colspan="2">U/A</th></tr>
<tr><td>1</td><td>Electrical symbols & fuses</td><td>06</td><td rowspan="2">Q1</td><td rowspan="4" colspan="2">Q5(a)</td></tr>
<tr><td>2</td><td>Transformers</td><td>09</td></tr>
<tr><td>3</td><td>Underground Cables</td><td>06</td><td rowspan="2">Q2</td></tr>
<tr><td>4</td><td>D.C & A.C windings</td><td>09</td></tr>
<tr><td>5</td><td>Line Supports and Industrial panel layouts</td><td>06</td><td>Q3</td><td rowspan="2">Q5(b)</td><td>Q6(a)</td></tr>
<tr><td>6</td><td>Power System Protection Equipments</td><td>09</td><td>Q4</td><td>Q6(b)</td></tr>
<tr><td colspan="2">Total</td><td>45</td><td>4</td><td colspan="2">4</td></tr>
</table>

Course Content

1. Electrical symbols & fuses

Duration: 6 Periods (L:2 P:4)

Graphical Electrical symbols of different electrical devices - Views of fuses

2. Transformers

Duration: 9 Periods (L:3 - P:6)

Single- phase single stepped core type transformer - Core sections, sectional views, Three phase three stepped core type transformers- Core sections, sectional views.

3. Underground Cables

Duration: 6 Periods (L:2 - P:4)

Cross sectional views of single core, 2 core, 3 core, 3.5 core & 4 core cables, H ,SL& HSL type cables -Flat cable

4. DC &AC winding

Duration: 9 Periods (L:3 - P:6)

Simplex lap and wave winding for DC armature - Single layer lap and wave winding for 1-phase and 3- phase AC machines

5. Line Supports and Industrial panel layouts

Duration: 6 Periods (L:2 - P:4)

Supporting steel towers –Poles – Stays & Guys – single line diagrams of LT panels-General arrangement Diagrams of LT Panels- single line diagram of substations - Single line diagram of Grid connected Solar PV system

6. Power system Protection Equipment

Duration: 9 Periods (L:3 - P:6)

Lightning arrestors – Circuit breakers - Earthing

Recommended Books

1. “Electrical Engineering Drawing” by S.K.Bhattacharya, NewAge International Publishers
2. “Electrical Drafting” - S.F. DEVALAPUR EEPB
3. “Electrical Drawing” - K.L. NARANG

Suggested E-Learning references

1. www.nptel.ac.in
2. https://www.academia.edu (https://www.academia.edu/26976158/ELECTRICAL_ENGINEERING_drawing_by_Dr._S_K_Bhattacharya.pdf)

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

1.0 Electrical symbols & fuses

1.1 Draw standard symbols of electrical components: Constant Resistor and variable Resistor, Constant Inductor and variable inductor, Constant capacitor and variable capacitor.

1.2 Draw standard symbols of electrical components: DC Voltage Source, DC current source, Battery, Single phase AC voltage source, three phase AC voltage source, transformer, Ammeter, Voltmeter, Power factor meter and Wattmeter.

1.3 Draw standard symbols of electrical fixtures: On way Switch and two ways Switch, Normally Open & Normally Close Push buttons, Fuse, Circuit breaker, Isolators, Ground and Electrical Switchbox.

1.4 Draw standard symbols of electrical fixtures: Wall mounted lamp fixture, Ceiling fan, Power vent fan, Fluorescent light fixture, Bell, Buzzer, Single and three phase Electric motors, Motor starter.

1.5 Draw Sectional end view of Rewirable fuse.

1.6 Draw Sectional Elevation of Rewirable fuse.

1.7 Draw Sectional end view of HRC fuse.

2.0 **Transformers**

2.1 Draw the cross section of single stepped core of one limb of transformer.

2.2 Draw the cross section of 2 stepped core of one limb of transformer.

2.3 Draw the cross section of 3 stepped core of one limb of transformer

2.4 Draw the plan of a single phase-single stepped core type transformer from the given data

2.5 Draw the sectional plan and Elevation of a single phase-single stepped core type transformer from the given data

2.6 Draw the sectional plan of a 3 phase 3 stepped core type transformer from the given data

2.7 Draw the sectional plan and elevation of a 3 phase 3 stepped core type transformer from the given data

3.0 Underground Cables

3.1 Draw the cross sectional view of single core cable.

3.2 Draw the cross sectional view of Two core cable.

3.3 Draw the cross sectional view of three core PVC insulated armoured cable.

3.4 Draw the cross sectional view of three core XLPE insulated armoured cable.

3.5 Draw the cross sectional view of 3.5 core PVC insulated armoured cable.

3.6 Draw the cross sectional view of 3.5 core XLPE insulated armoured cable.

3.7 Draw the cross sectional view of four core PVC insulated armoured cable.

3.8 Draw the cross sectional view of four core XLPE insulated armoured cable.

3.9 Draw the cross sectional view of H type cable.

3.10 Draw the cross sectional view of S.L type cable.

3.11 Draw the cross sectional view of H. S.L type cable.

3.12 Draw the cross sectional view of PVC insulated 3 core flat cable.

4.0 **DC &AC winding**

4.1 Develop winding diagram for a simplex Lap connected DC machine

4.2 Develop winding diagram for a simplex Wave connected DC machine

4.3 Develop winding diagram of a 1-phase single layer and double layer lap winding.

4.4 Develop winding diagram of a 1-phase single layer and double layer wave winding.

4.5 Develop winding diagram of a 3-phase single layer lap winding.

4.6 Develop winding diagram of a 3-phase single layer wave winding.

5.0 Line Supports and Industrial panel layouts

5.1 Draw the sketch of 132 KV steel tower of single circuit.

5.2 Draw the sketch of 132 KV steel tower of double circuit.

5.3 Draw the sketch of 220 KV steel towers of single circuit.

5.4 Draw the sketch of 220 KV steel towers of double circuit.

5.5 Draw the sketch of three phase 11KV pole.

5.6 Draw the view of stranded steel wire guy marking all the accessories.

5.7 Draw the Single Line Diagram of LT Panel with 400 A incomer,1No 200 A Outgoing feeder and 2 No's 100 A outgoing feeders

5.8 Draw the General arrangement Diagram(Layout) of LT Panel with 400 A incomer,1 No 200 A Outgoing feeder and 2 No's 100 A outgoing feeders

5.9 Draw the single line diagram of 33kV / 11kV substation.

5.10 Draw the single line diagram of 220KV/132 KV substation

5.11 Draw single line diagram of Grid connected solar PV system.

5.12 Draw the elevation of Plinth mounted substation.

5.13 Draw the elevation of Pole mounted substation.

6.0 **Power system Protection Equipment**

6.1 Draw the dimensioned sketch of Pipe earthing.

6.2 Draw the dimensioned sketch of Plate earthing.

6.3 Draw the sketch of Expulsion type lightning arrestor.

6.4 Draw the sketch of thyrite type lightning arrestor.

6.5 Draw the sketch of metal oxide type lightning arrestor.

6.6 Draw the sketch of Minimum oil circuit breaker with neat labelling.

6.7 Draw the sketch of Vacuum circuit breaker with neat labelling.

6.8 Draw the sketch of SF6 circuit breaker with neat labelling.

Suggested Student Activities

1 Student visits Distribution Transformer i.e., Pole mount and Plinth mount, note down the ratings of transformer and draw the sketch of the substation mentioning the parts.

2 Student should identify voltage ratings of different electrical lines and supports including LA's, Guys etc running near their area and share the information on the same.

3 Group discussion

4 Surprise test

CO-PO Mapping Matrix

	Basic and Discipline Specific knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation & Testing	Engineering practices for society, sustainability and environment	Project Management	Lifelong learning	Linked PO
CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	
CO1	-	1	3	3	-	-	3	2,3,4,7
CO2	1	3	3	3	-	-	3	1,2,3,4,7
CO3	-	3	3	3	-	-	3	2,3,4,7
CO4	-	3	3	3	-	-	3	2,3,4,7
CO5	-	3	3	3	-	-	3	2,3,4,7
CO6	-	3	3	3	-	-	3	2,3,4,7

Continuous Internal Evaluation (CIE)

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignment	1	5
Seminars	1	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)/ Understanding(U)	2	4	Nil	8 Marks
02	Part-B	Understanding(U)/ Application(A)	2	12	1	12 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R/U	U/A
1	Unit-I	Q1	Q3(a)
2	Unit-II	Q2	Q3(b)
Total Questions		2	2

MID SEM-II EXAM

S.No	Unit No	R/U	U/A
1	Unit-III	Q1	Q3(a)
2	Unit-IV	Q2	Q3(b)
Total Questions		2	2

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	4	Nil	16 Marks
02	Part-B	Understanding(U)/ Application(A)	4	12	2	24 Marks
Total Marks						40 Marks

Unit No	**Questions to be set for SEE**		
	R/U	**U/A**	
I	Q1	Q5(a)	
II			
III	Q2		
IV			
V	Q3	Q5(b)	Q6(a)
VI	Q4		Q6(b)
Total	4	4	

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DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: EE-406
ELECTRICAL ENGINEERING DRAWING

MID SEM -I EXAM MODEL PAPER

TIME: 1 HOUR **TOTAL MARKS: 20**

PART – A **Marks: 2 X 4M= 8**

Instructions: (1) Answer all questions
(2) Each question carries **Four** marks.

1. Draw the following electrical symbols
   i) Battery
   ii) Buzzer
   iii) Capacitor
   iv) Ammeter
   v) fuse
2. Draw the cross section of 2 stepped core of one limb of transformer

PART - B **Marks: 1 x12M = 12**

Instructions: (1) Answer the following question.
(2) Each question carries **twelve** marks.

3. (a) Draw the following views of a single phase 220/110 V 10 KVA transformer
   a) Front elevation
   b) Plan in full section

   Core: 1. Cross section of the core =one step core
   2. Diameter of the circumcircle =7.5 cm
   3. Distance between core centres =15 cm

   Yoke height =8 cm

   LT winding: 1.Outside diameter of LT coil =9 cm
   2.Inside diameter of LT coil=8 cm
   3. Height of LT winding =23 cm
   4. Number of turns per limb=50

   HT winding: 1.Outside diameter of HT coil =13.5 cm
   2. Inside diameter of LT coil=11 cm
   3. Height of LT winding =23 cm
   4. Number of turns per limb=100

   Total height of the transformer =40 cm

(OR)

3(b) Draw Sectional Plan and Elevation of Rewirable fuse.

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DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: EE-406
ELECTRICAL ENGINEERING DRAWING

MID SEM -II EXAM MODEL PAPER

TIME: 1 HOUR **TOTAL MARKS: 20**

PART – A

Marks: 2 X 4M= 8

Instructions: (1) Answer all questions
(2) Each question carries **Four** marks.

1. Draw the cross sectional view of Two core cable.
2. Draw the table to develop winding diagram of a Single phase 4 pole induction motor with 24 slots, single layer full pitched lap winding.

PART - B **Marks: 1 x12M = 12**

Instructions: (1) Answer the following question.
(2) Each question carries **twelve** marks.

3(a) Develop winding diagram for a DC machine with 4 Pole 24 slot simplex Wave progressive winding with table.

OR

3(b) Draw the cross sectional view of four-core XLPE insulated armoured cable.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING ,TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SUB CODE: EE-406
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SEMESTER END EXAM MODEL PAPER

TIME: 2 HRS **TOTAL MARKS: 40**

PART – A **Marks: 4 X 4M= 16**

Instructions: (1) Answer all questions
(2) Each question carries **Four** marks.

1. Draw Sectional end view of HRC fuse.
2. Draw the cross sectional view of 3 core armoured cable
3. Draw the single line diagram of 33kV / 11kV substation
4. Draw the free hand sketch of Thyrite type lightning arrester

PART - B **Marks: 2x12M = 24**

Instructions: (1) Answer all questions.
(2) Each question carries **twelve** marks.

5(a) Draw the elevation of Plinth mounted substation.

OR

5(b) Draw the dimensioned sketch of Plate earthing.

6(a) Draw single line diagram of Grid connected solar PV system.

OR

6(b) Draw the sketch of Minimum oil circuit breaker with neat labeling.

EE-407-DC MACHINES LAB

Course Title	DC Machines Lab	Course Code	EE-407
Semester	IV	Course Group	Practical
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the skills of handling electrical tools, accessories and performing wiring connections

Course Outcomes

At the end of the course the students will have the ability to:

Course Outcomes	
CO1	Identify the terminals of DC Motors and parts of Starters
CO2	Sketch the performance characteristics of DC Motors by conducting suitable Tests.
CO3	Apply various speed control methods on DC motors
CO4	Draw and interpret the performance characteristics of DC Generators by Conducting suitable experiments.

Suggested Learning Outcomes

1.0 Identify the terminals of DC Motors and parts of Starters.

1.1 Identify the terminals of DC Shunt Motors

1.2 Identify the terminals of DC Series Motors

1.3 Identify the terminals of DC Compound Motors

1.4 Identify the parts of DC 3 point starter

1.5 Identify the parts of DC 4 point starter

2.0 Sketch the performance characteristics of DC Motors by conducting suitable Tests.

2.1 Obtain performance characteristics by conducting Brake Test on DC Shunt Motor

2.2 Obtain performance characteristics by conducting Brake Test on DC Series Motor.

2.3 Obtain performance characteristics by conducting Brake Test on DC Compound Motor.

2.4 Obtain performance of DC Shunt Motor by conducting Swinburne's Test.

3.0 Apply various speed control methods on DC motors

3.1 Speed control of DC Shunt Motor by Armature control method

3.2 Speed control of DC Shunt Motor by Field control method

4.0 Draw and interpret the performance characteristics of DC Generators by conducting suitable experiments.

4.1 Obtain OCC of a DC shunt Generator at rated speeds

4.2 Obtain Internal and External characteristics of DC Shunt Generator

4.3 Obtain Internal and External characteristics of DC Series Generator.

4.4 Obtain Internal and External characteristics of DC Compound Generator

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1		3	3	1				3	2		2,3,4,8,9
CO2	2	3	3	3				3	2		1,2,3,4,8,9
CO3	2	3	3	3				3	2		1,2,3,4,8,9
CO4	2	3	3	3				3	2		1,2,3,4,8,9

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER
MID SEMESTER-I EXAMINATION

Course Code: EE-407 **Duration: 1 Hour**
Course Name: DC Machines Lab **Max. Marks: 20**

Note: ***Answer allotted Question.***

Instructions to the Candidate:

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1. Identify the terminals of DC Shunt motor
2. Identify the terminals of DC Series motor
3. Identify the terminals of DC Compound motor
4. Identify the parts of a 3 point starter
5. Identify the parts of a 4 point starter
6. Obtain performance characteristics by conducting Brake Test on DC Shunt Motor
7. Obtain performance characteristics by conducting Brake Test on DC Series Motor

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER
MID SEMESTER-II EXAMINATION

Course Code: EE-407 **Duration: 1 Hour**
Course Name: DC Machines Lab **Max. Marks: 20**

Note: ***Answer allotted Question.***

Instructions to the Candidate:

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1. Obtain performance characteristics by conducting Brake Test on DC Compound Motor.
2. Obtain performance of DC Shunt Motor by conducting Swinburne's Test.
3. Speed control of DC Shunt Motor by Armature control method
4. Speed control of DC Shunt Motor by Field control method

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, TELANGANA
MODEL QUESTION PAPER
DEEE IV SEMESTER
SEMESTER END EXAMINATION

Course Code: EE-407 **Duration: 2 Hour**
Course Name: DC Machines Lab **Max. Marks: 40**

Note: ***Answer allotted Question.***

Instructions to the Candidate:

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1. Identify the terminals of DC Shunt motor
2. Identify the terminals of DC Series motor
3. Identify the terminals of DC Compound motor
4. Identify the parts of a 3 point starter
5. Identify the parts of a 4 point starter
6. Obtain performance characteristics by conducting Brake Test on DC Shunt Motor
7. Obtain performance characteristics by conducting Brake Test on DC Series Motor.
8. Obtain performance characteristics by conducting Brake Test on DC Compound Motor.
9. Obtain performance of DC Shunt Motor by conducting Swinburne's Test.
10. Speed control of DC Shunt Motor by Armature control method
11. Speed control of DC Shunt Motor by Field control method
12. Obtain OCC of a DC shunt Generator at rated speeds
13. Obtain Internal and External characteristics of DC Shunt Generator
14. Obtain Internal and External characteristics of DC Series Generator.
15. Obtain Internal and External characteristics of DC Compound Generator

EE-408-ELECTRICAL CAD LAB

Course Title	Electrical CAD Lab	Course Code	EE-408
Semester	IV	Course Group	Practical
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Pre-requisites

This course requires the knowledge of basic commands of CAD software.

Course Outcomes

CO1 :	Draw the symbols of Electrical components
CO2 :	Draw the wiring layouts
CO3 :	Draw the views of Electrical machines
CO4 :	Draw the single line diagram of the Substations
CO5 :	Draw the HV line supports
CO6 :	Draw the views of Earthing

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

1.0 Draw the symbols of Electrical components

1.1 Draw standard symbols of electrical components: Constant Resistor and variable Resistor, Constant Inductor and variable inductor, Constant capacitor and variable capacitor, transformer.

1.2 Draw standard symbols of electrical components: DC Voltage Source, DC current source, Battery, Single phase AC voltage source, three phase AC voltage source, Wall mounted lamp fixture, Ceiling fan.

1.3 Draw standard symbols of electrical fixtures: On way Switch and two ways Switch, Normally Open & Normally Close Push buttons, Fuse, Circuit breaker, Isolators and Ground.

2.0 Draw the wiring layouts

2.1 Draw the wiring layout for a given Single bedroom house.

2.2 Draw the Wiring diagram of 3 phase Induction motor with energy meter, 1-phase preventer, Y- Δ starter with control panel/switchboard.

2.3 Draw the wiring layout of Pump shed for given dimensions.

2.4 Draw the wiring layout of workshop(with 2 or 3 Induction motors)

3.0 Draw the views of Electrical machines

3.1 Draw the cross section of single stepped core of one limb of transformer.

3.2 Draw the cross section of 2 stepped core of one limb of transformer.

3.3 Draw the cross section of 3 stepped core of one limb of transformer.

3.4 Draw sectional Plan of a single-phase single stepped core type Transformer from the given data.

3.5 Draw sectional plan of a 3 phase three stepped core type transformers from the given data.

3.6 Draw Plan & Elevation of a 3 phase transformers with cooling tubes.

3.7 Draw Elevation & End view of a 3 Squirrel cage Induction motor.

3.8 Draw Elevation & End view of a 3 Slip ring Induction motor.

4.0 Draw the single line diagram of the Substations

4.1 Draw the single line diagram of 33kV / 11kV substation.

4.2 Draw single line diagram of Grid connected solar PV system.

5.0 Draw the HV line supports

5.1 Draw the sketch of 132 KV steel tower of single circuit.

5.2 Draw the sketch of 132 KV steel tower of double circuit.

5.3 Draw the sketch of 220 KV steel towers of single circuit.

5.4 Draw the sketch of 220 KV steel towers of double circuit.

6.0 **Draw the views of Earthing**

6.1 Draw the dimensioned sketch of Plate earthing.

6.2 Draw the dimensioned sketch of Pipe earthing

Recommended Books

1. Computer Aided Electrical Drawing - YOGESH, NAGARAJA, NANDAN PHI Publication
2. Electrical Drafting - S.F. DEVALAPUR EEPB
3. Electrical Drawing - K.L. NARANG
4. Electrical Engineering Drawing – S. K. BHATTACHARYA
5. QCAD - An Introduction to Computer-Aided Design - By Andrew Mustun

Suggested E-Learning references

1. http://www.faveodesign.co.uk/CAD_Drawings.html
2. http://cad.about.com/od/Learn_CAD/a/The-Fundamentals-Of-Drafting.htm
3. http://transport.itu.edu.tr/PDF/iml332e/Fundamentals%20of%20CAD.

CO-PO Mapping Matrix

	Basic and Discipline Specific knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation & Testing	Engineering practices for society, sustainability and environment	Project Management	Lifelong learning	Linked PO
CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	
CO1	3	1	-	-	2	2	3	1,2,5,6,7
CO2	3	-	2	3	2	2	3	1,3,4,6,7
CO3	-	1	3	2	2	2	3	2,3,4,5,6,7
CO4	-	3	3	3	2	2	3	2,3,4,5,6,7
CO5	3	2	3	3	2	2	3	1,2,3,4,6,7
CO6	3	2	3	3	2	2	3	1,2,3,4,6,7

STATE BOARD OF TECHNICAL EDUCATION &TRAINING ,TELANGANA
MID SEM - I

Course Code: EE-408 **Duration: 1 hour**

Course Name: Electrical CAD Lab **Max.Marks:20**

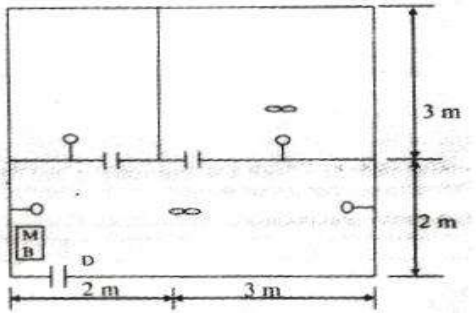
-----Note: ***Answer allotted Question.***

<u>Instructions to the Candidate:</u>

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1 Draw standard symbols of electrical components: Constant Resistor and variable Resistor, Constant Inductor and variable inductor, Constant capacitor and variable capacitor, transformer.
2 Draw standard symbols of electrical components: DC Voltage Source, DC current source, Battery, Single phase AC voltage source, three phase AC voltage source, Wall mounted lamp fixture, Ceiling fan.
3 Draw standard symbols of electrical fixtures: On way Switch and two way Switch, Normally Open & Normally Close Push buttons, Fuse, Circuit breaker, Isolators and Ground.
4 Draw the wiring layout for a given Single bedroom house



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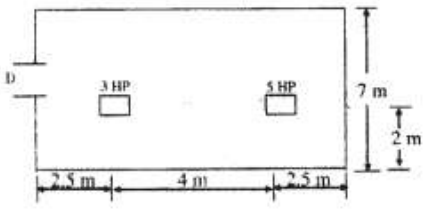
5 Draw the Wiring diagram of 3 phase Induction motor with energy meter, 1-phase preventer, Y- Δ starter with control panel/switchboard.
6 Draw the wiring layout of Pump shed for dimensions given as below:
The distance between the LT pole and pump set shed (5m x 3m x 3m) is 10m. Assume any missing data.

7 Draw the wiring layout of given workshop.



STATE BOARD OF TECHNICAL EDUCATION &TRAINING ,TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
MID SEM - II

Corse Code: EE-408 **Duration:1 hour**

Course Name: Electrical CAD Lab **Max.Marks:20**

Note: ***Answer allotted Question.***

Instructions to the Candidate:

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1 Draw the cross section of single stepped core of one limb of transformer.
2 Draw the cross section of 2 stepped core of one limb of transformer.
3 Draw the cross section of 3 stepped core of one limb of transformer.
4. Draw sectional Plan of a 1-phase, 220/660 V, 2 kVA core-type transformer with the following data : Cross-section of the core is One step, Diameter of the circle 6 cm, Distance between core centres 13cm.
   LT Winding: Outer diameter of 1st layer 9cm Inner diameter of 1st layer 6.5 cm
   HT Winding: Outer diameter of HT winding 11 cm Inner diameter of HT winding 9·5 cm.
5. Draw sectional plan of a 3-phase, 220/660 V, 10 kVA core-type transformer with the following data: Cross-section of the core is 3 stepped Diameter of the circle 6·5 cm Distance between core centres 18·5 cm.
   LT Winding: Outer diameter of 1st layer 9·25 cm Inner diameter of 1st layer 7·0 cm Outer diameter of 2nd layer 12·1 cm Thickness of each layer 1·2 cm
   HT Winding: Outer diameter of HT winding 17·0 cm Inner diameter of HT winding 12·5 cm
6 Draw Plan & Elevation of a 3 phase transformers with cooling tubes.
7 Draw Elevation & End view of a 3 Squirrel cage Induction motor.
8 Draw Elevation & End view of a 3 Slip ring Induction motor.
9 Draw the single line diagram of 33kV / 11kV substation.
10 Draw single line diagram of Grid connected solar PV system.

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DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SEMESTER END EXAMINATION

Corse Code: EE-408 **Duration:2 hours**

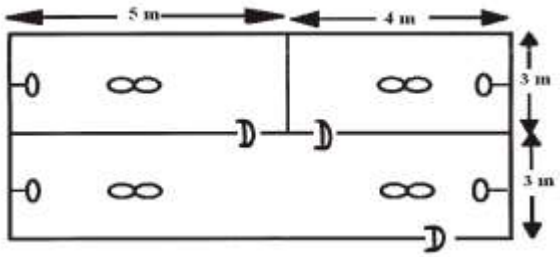
Course Name: Electrical CAD Lab **Max.Marks:40**

Note: ***Answer allotted Question.***

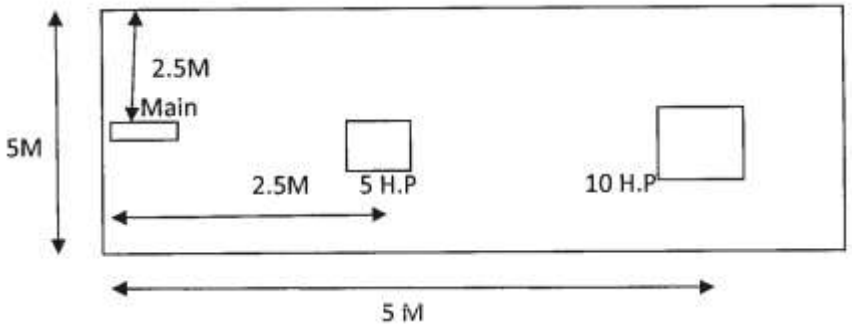
Instructions to the Candidate:

(i) Choose appropriate values when not mentioned in the question

a. Draw standard symbols of electrical components: Constant Resistor and variable Resistor, Constant Inductor and variable inductor, Constant capacitor and variable capacitor, transformer.
b. Draw standard symbols of electrical components: DC Voltage Source, DC current source, Battery, Single phase AC voltage source, three phase AC voltage source, Wall mounted lamp fixture, Ceiling fan.
c. Draw standard symbols of electrical fixtures: On way Switch and two way Switch, Normally Open & Normally Close Push buttons, Fuse, Circuit breaker, Isolators and Ground.
d. Draw the wiring layout for a given Single bedroom house.



e. Draw the Wiring diagram of 3 phase Induction motor with energy meter, 1-phase preventer, Y- Δ starter with control panel/switchboard.
f. Draw the wiring layout of an irrigation pump set of 7·5 kW is to be installed at a distance of 15 m from a 3-phase, 415 V, distribution line. The pump room dimensions are 3 m × 5 m, – 3·5 m height. Efficiency and power factors are 85% and 0·9 respectively. Assume any missing data.
g. Draw the wiring layout of workshop



h. Draw the cross section of single stepped core of one limb of transformer with diameter of circle as 6 cm.
i. Draw the cross section of 2 stepped core of one limb of transformer with diameter of circle as 8 cm.
j. Draw the cross section of 3 stepped core of one limb of transformer with diameter of circle as 7.5 cm.
k. Draw sectional Plan of a 1-phase, 220/660 V, 2 kVA core-type transformer with the following data : Cross-section of the core is One step, Diameter of the circle 6 cm, Distance between core centres 13cm.
   LT Winding: Outer diameter of 1st layer 9cm Inner diameter of 1st layer 6.5 cm
   HT Winding: Outer diameter of HT winding 11 cm Inner diameter of HT winding 9·5 cm.
l. Draw the sectional plan of a 3-phase, 220/660 V, 10 kVA core-type transformer with the following data: Cross-section of the core is 3 stepped Diameter of the circle 6·5 cm Distance between core centres 18·5 cm.
   LT Winding: Outer diameter of 1st layer 9·25 cm Inner diameter of 1st layer 7·0 cm Outer diameter of 2nd layer 12·1 cm Thickness of each layer 1·2 cm
   HT Winding: Outer diameter of HT winding 17·0 cm Inner diameter of HT winding 12·5 cm
m. Draw Plan & Elevation of a 3 phase transformers with cooling tubes.
n. Draw Elevation & End view of a 3 Squirrel cage Induction motor.
o. Draw Elevation & End view of a 3 Slip ring Induction motor.
p. Draw the single line diagram of 33kV / 11kV substation.
q. Draw single line diagram of Grid connected solar PV system.
r. Draw the sketch of 132 KV steel tower of single circuit.
s. Draw the sketch of 132 KV steel tower of double circuit.
t. Draw the sketch of 220 KV steel towers of single circuit.
u. Draw the sketch of 220 KV steel towers of double circuit.
v. Draw the dimensioned sketch of Plate earthing.
w. Draw the dimensioned sketch of Pipe earthing

EE-409-AC MACHINES LAB

Course Title	AC Machines Lab	Course Code	EE-409
Semester	IV	Course Group	Practical
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Pre-requisites

This course requires the knowledge of AC machines Transformers and Alternators.

Course Outcomes

CO1 :	Evaluate the performance of single phase transformer by conducting suitable tests.
CO2 :	Analyze the load sharing between two Single phase transformers when they are operated in parallel
CO3 :	Familiarize with Three phase Transformers
CO4 :	Determine the dielectric strength of transformer oil
CO5 :	Determine regulation of an Alternator by conducting suitable tests
CO6 :	Synchronise the given Alternator with Supply Mains

Suggested Learning Outcomes

After completion of the subject, the student shall be able to

1.0 Evaluate the performance of single phase transformer by conducting suitable tests.

1.1 Identify the terminals on 1-phase transformer.

1.2 Conduct turns ratio test on given single phase transformer.

1.3 Conduct O.C. and S.C. tests on 1-phase Transformer and from the result

a. Draw the equivalent circuit.

b. Calculate efficiency at various loads and power factors.

c. Find the load at which maximum efficiency occurs.

1.4 Obtain efficiency of 1-phase Transformer by conducting load test.

1.5 Obtain regulation of 1-phase Transformer by conducting load test.

1.6 Obtain the efficiency and regulation of two similar 1-phase transformers by conducting Sumpner's test.

2.0 Analyze the load sharing between two Single phase transformers when they are operated in parallel

2.1 Connect two identical 1-ph transformers in parallel and analyze the load sharing.

3.0 Familiarize with Three phase Transformers

3.1 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y-Y topology.

3.2 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y- Δ topology.

3.3 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ -Y topology.

3.4 Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ - Δ topology.

Note: Three single phase transformers may be used instead of a three phase transformer.

4.0 Determine the dielectric strength of transformer oil

4.1 Obtain the Dielectric Strength of transformer oil using oil testing kit.

5.0 Determine regulation of an Alternator by conducting suitable tests

5.1 Obtain voltage regulation by conducting (direct) load test on Alternator.

5.2 Obtain the regulation of Alternator by using synchronous impedance method.

6.0 Synchronise the given Alternator with Supply Mains

6.1. Synchronise the given Alternator with supply mains by using bright lamp method

6.2. Synchronise the given Alternator with supply mains by using bright lamp method

Recommended Books

1. B.L. Theraja-Electrical Technology - Vol -II S.Chand& Co.
2. M.G Say -AC machines
3. P.S. Bhimbra -Electrical machines - Khanna Publishers
4. A.E. Fritzgerald, C. Kingsley and S. Umans Electrical machinery-McGraw Hill
5. MV Deshpande-Electric machines - Wheeler publishing.
6. BR Gupta and VandanaSinghal - Fundamentals of Electric machines

Suggested E-Learning references

1. http://electrical4u.com/
2. www.nptel.ac.in
3. https://www.siemens.com/content/dam/internet/siemens-com/global/products-services

CO-PO Mapping Matrix

	Basic and Discipline Specific knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation & Testing	Engineering practices for society, sustainability and environment	Project Management	Lifelong learning	Linked PO
CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	
CO1	3	1	-	-	2	2	3	1,2,5,6,7
CO2	3	-	2	3	2	2	3	1,3,4,6,7
CO3	-	1	3	2	2	2	3	2,3,4,5,6,7
CO4	-	3	3	3	2	2	3	2,3,4,5,6,7
CO5	3	2	3	3	2	2	3	1,2,3,4,6,7
CO6	3	2	3	3	2	2	3	1,2,3,4,6,7

STATE BOARD OF TECHNICAL EDUCATION &TRAINING ,TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
MID SEM - I

Course Code: EE-409 **Duration: 1 hours**

Course Name: AC Machines Lab **Max.Marks:20**

Note: ***Answer allotted Question.***

Instructions to the Candidate:

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1. Identify the terminals on 1-phase transformer and determine the turn ratio on transformer
2. Conduct O.C. and S.C. tests on 1-phase Transformer and from the result
   a) Draw the equivalent circuit.
   b) Calculate efficiency at various loads and power factors.
   c) Find the load at which maximum efficiency occurs.
3. Obtain efficiency of 1-phase Transformer by conducting load test.
4. Obtain regulation of 1-phase Transformer by conducting load test.
5. Obtain the efficiency and regulation of two similar 1-phase transformers by conducting Sumpner's test.
6. Connect two identical 1-ph transformers in parallel and analyze the load sharing.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING ,TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
MID SEM - II

Corse Code: EE-409 **Duration:1 hours**

Course Name: AC Machines Lab
Max.Marks:20

Note: ***Answer allotted Question.***

Instructions to the Candidate:

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y-Y topology.
2. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y- Δ topology.
3. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ -Y topology.
4. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ - Δ topology.
5. Obtain the Dielectric Strength of transformer oil using oil testing kit.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TELANGANA
DIPLOMA IN ELECTRICAL & ELECTRONICS ENGG.
SEMESTER END EXAMINATION

Course Code: EE-409 **Duration:2 hours**

Course Name: AC Machines Lab
Max.Marks:40

Note: ***Answer allotted Question.***

Instructions to the Candidate:

(i)Record the results on a graph sheet if required, and conclude your observation of the experiment

(ii) Draw the circuit diagram for illustration; choose appropriate values when not mentioned in the question

1. Identify the terminals on 1-phase transformer and determine the turn ratio on transformer
2. Conduct O.C. and S.C. tests on 1-phase Transformer and from the result
   a) Draw the equivalent circuit.
   b) Calculate efficiency at various loads and power factors.
   c) Find the load at which maximum efficiency occurs.
3. Obtain efficiency of 1-phase Transformer by conducting load test.
4. Obtain regulation of 1-phase Transformer by conducting load test.
5. Obtain the efficiency and regulation of two similar 1-phase transformers by conducting Sumpner's test.
6. Connect two identical 1-ph transformers in parallel and analyze the load sharing.
7. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y-Y topology.
8. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Y- Δ topology
9. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ -Y topology.
10. Verify the relation between (i) Phase Voltage & Line Voltage (ii) Phase current & Line Current of three phase transformer in Δ - Δ topology.
11. Obtain the Dielectric Strength of transformer oil using oil testing kit.
12. Obtain voltage regulation by conducting (direct) load test on Alternator.
13. Obtain the regulation of Alternator by using synchronous impedance method.
14. Synchronise the given Alternator with supply mains by using bright lamp method

HU -410 – Employability Skills Lab

Course Title	Employability Skills Lab	Course Code	HU-410
Semester	IV	Course Group	Core
Teaching Scheme in Hrs (L:T:P)	1:0:2	Credits	1.5
Methodology	Pair Work, Group Work, Activities, Lecture, Self-Learning	Total Contact Hours	45 (3 contact hours per week)
CIE	60 Marks	SEE	40 Marks

Rationale:

The course is designed to impart employability skills to make the students of diploma get the initial employment, maintain the employment and get better employment, if they wish.

Prerequisites:

The course requires the basic knowledge of vocabulary, grammar, four language learning skills, viz. listening, speaking, reading and writing and life skills.

Course Outcomes

CO1	Comprehend the importance of employability skills and strategies to survive in a job.
CO2	Converse fluently and accurately accordingly in JAM sessions. Group Discussions will enhance the willingness to take the Initiative, accept adaptability in turn developing leadership qualities and Communication Skills.
CO3	Understand purpose and process of interview in turn knowing how to prepare and succeed in interview.
CO4	Making effective presentation, Develop Public speaking skills and learn to make visually attractive PPTs.
CO5	Learn various writing formats useful at workplace and to develop an ability to apply technical information in documentation.
CO6	Build strong workplace relationships by learning workplace etiquette, professional ethics and importance of gender sensitization.

Course Contents

Module 1: Introduction to Employability Skills

Duration: 6 Periods (L 2 P 4)

a. Filling the Curriculum gaps
   i. Attributes and values
   ii. Specific and general skills
   iii. Academic Knowledge and Aptitude Skills
   iv. Analytical skills / Data Analysis
b. How to get into a job?
   i. Good personal presentation and attitude
   ii. Core generic skills
   iii. Technical / Professional skills

iv. Good Communication skills

c. How to survive in a job?
   i. Learning skills needed for self-advocacy and networking
   ii. Adaptability to cope with the changing circumstances.
   iii. Reliability and Integrity
   iv. Continuous Learning and Consistency in performance.

Module 2: JAM & Group Discussion

Duration: 9 Periods (L 3 P- 6)

i. What is JAM?
ii. Significance of JAM
iii. Enhancing Speaking skills, fluency, usage, coherence, spontaneity, voice modulation, eye contact, body language, Creativity, Sense of humor, Confidence and Time management.
iv. Learn avoiding hesitation, deviation and repetition
v. Purpose of Group Discussion
vi. Types of Group Discussion
vii. Different expressions and phases and their effective usage
   a. Opinion expression agrees and disagrees, partially agree or disagree, interrupt politely, add new information and conclusion
viii. Dos and Don'ts of a Group Discussion
ix. Importance of body language, Etiquettes and awareness of group dynamics
x. Practice.

Module 3: Interview Skills

Duration: 9 Periods (L 3 P 6)

i. Importance of interview skills
ii. Types of interviews
   a) Face to Face / One to One, Telephonic / Video, Panel Interview.
iii. Understanding the process of interview.
   a) Before the interview
   b) On the day of the interview
   c) After the interview
iv. FAQs, Common expressions of an interviewer and interviewee
v. Acceptable and unacceptable gestures. Body language, and Attire,
vi. Do's and Don'ts of an interview
vii. Mock Interviews

Module 4: Presentation Skills:

Duration: 9 Periods (L-3 P-6)

a) Significance of presentation
b) Types of presentations.
   i. Informative, Instructional, Arousing, Persuasive and Decision-Making
c) . What makes a good presentation?
   i. Understand, Collect, Organize, Use presentational aids and Practice

d) Tips for an effective presentation

i. Good Beginning – Greeting, Confidence, Body Language, Opening Ideas (Funny Videos, Ridicule. Asking Questions, Quote someone/Proverb or telling a story/referring an historical event)

ii. Unveiling – Develop systematically, usage of appropriate linkers or discourse markers. Eye contact and Effective usage of PPTs

iii. Conclusion – Summarize - Giving time to the audience for queries and Time management

e) Guidelines for PPTs

f) Public Speaking Skills

i. Benefits – Personal and Professionals.

ii. Strategies to improve public speaking skills.

iii. Obstacles to effective public speaking.

iv. Overcoming the barriers of public speaking.

g) Prepare presentation template.

Module 5: Writing Skills at Workplace:

Duration: 6 Periods (L – 2 P – 4)

a) Various writing formats useful at workplace
b) Skills involved in writing at workplace
c) Different templates for different purposes
d) Useful technical information in documentation

Module 6: Workplace Awareness

Duration 6 Periods (L – 2 P – 4)

a) Workplace etiquette
b) Knowledge, skills and attributes useful at workplace
c) Workplace Relationships
d) Professional ethics
e) Importance of gender sensitization
f) Sense of responsibility towards the society

Suggested Student Activities:

- Paper Presentations
- Seminars
- Mock Interviews
- Telephonic Interviews
- Group Discussions
- Role Plays
- Creating advertisements
- Five-minute activities
- Creating a model of workplace

Course Outcomes

CO1	Comprehend the importance of employability skills and strategies to survive in a job.
CO2	Converse fluently and accurately accordingly in JAM sessions. Group Discussions will enhance the willingness to take the Initiative, accept adaptability in turn developing leadership qualities and Communication Skills
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CO4	Making effective presentation, develop public speaking skills and learn to make visually attractive PPTs.
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CO6	Build strong workplace relationships by learning workplace etiquette, professional ethics and importance of gender sensitization.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
410.1	-	-	-	-	3		3	5,7
410.2	-	-	-	-	3	2	3	5,6,7
410.3	-	-	-	-	3	3	3	5,6,7
410.4	-	-	-	-	2	2	3	5,6,7
410.5	-	-	-	-	2	2	3	5,6,7
410.6		-	--	--	2		3	5,7

Evaluation Pattern:

I. Continuous Internal Examination: 60 Marks

a. **Mid Sem - I** 20 marks
   Syllabus:
   i. Introduction to Employability skills
   ii. JAM & Group Discussion

b. **Mid – II** 20 Marks
   Syllabus:
   i. Interview Skills
   ii. Presentation skills

c. **Internal assessment** 20 marks

   i. Seminars: 10 marks
   ii. Assignments: 5 marks
   iii. Lab record submission: 5 marks

II. Semester End Examination: 40 Marks

a. Write an essay on a given topic or participate in an activity: 15 Marks
b. Interview or Group Discussion: 15 Marks
c. *Viva Voce* 10 marks

References:

Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.

Ajmani, J. C. *Good English: Getting it Right*. New Delhi: Rupa Publications, 2012.

Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.

Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.

Fensterheim, Herbert and Jean Baer. *Don't Say Yes When You Want To Say No*. New York: D

Raman, Meenakshi & Sangeeta Sharma. *Technical Communication: Principles and Practice*. Second Edition. New Delhi: Oxford University Press, 2011

E-Learning Resources:

http://www.dailywritingtips.com/
http://www.englishdaily626.com/c-errors.php
http://www.owlnet.rice.edu/~cainproj/
http://www.thehumorsource.com/
http://www.indiabix.com/group-discussion/topics-with-answers/
http://networketiquette.net/
https://public.wsu.edu/~brians/errors

http://www.bbc.co.uk/worldservice/learningenglish/radio/specials/15

Unit No	Unit name	Periods	Questions for SEE			Marks weightage	%Weightage
			R	U	A		
1.	Introduction to Employability Skills	**6**			**2**	**2**	
2	JAM/ Group Discussions	**9**			**2**	**2**	
3	Interview Skills	**9**			**2**	**2**	
4.	Presentation Skills	**9**			**2**	**2**	
5.	Writing skills at work place	**6**			**1**	**1**	
6.	Workplace awareness	**6**			**1**	**1**	
	Total	**45**			**10**		**100**

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION – I
HU-410- EMPLOYABILITY SKILLS LAB

Time: 1 Hour **Total Marks: 20**

Part – A **10 marks**

Instruction: *Answer any one of the following questions.*

1. Write a paragraph on the importance of employability skills.
2. List out the important employability skills.
3. Mention the different strategies to enhance the employability skills.

Part – B **10 marks**

Instruction: *Answer any one of the following questions.*

4. What are the rules to be implemented in a JAM session?
5. What are the do's and don'ts of a group discussion.
6. List out the steps involved in a group discussion and mention some phrases and expressions commonly used.

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION - II
HU-410- EMPLOYABILITY SKILLS LAB

Time : 1 Hour **Total Marks: 20**

Part – A **10 marks**

Instruction: *Answer any one of the following questions.*

1. Write a list of frequently asked questions in an interview. Write the answers for the questions.
2. Mention the instructions to attend a telephonic interview.
3. What are the do's and don'ts for a formal interview?

Part – B **10 marks**

Instruction: *Answer any one of the following questions.*

4. Write the various steps involved in making presentations effectively.
5. What are the do's don'ts of body language during a presentation?
6. List out a few audio-visual aids and explain their role in making an effective presentation.

BOARD DIPLOMA EXAMINATION (C-21)
SEMESTER END EXAMINATION
HU-410- EMPLOYABILITY SKILLS LAB

Time: 3 Hours **Total Marks: 40**

Part – A **10 marks**

Instruction: *Pick any one question from the given lot.*

1. How are employability skills helpful to secure a good job?
2. Describe the steps involved in JAM and group discussion.
3. Write the guidelines involved in making a good presentation.
4. List few professional ethics useful at workplace.
5. Mention few skills involved in writing at workplace.

Part – B **15 marks**

6. Interview / Group Discussion

Part – C **15 marks**

7. *Viva Voce*

EE-411-SKILL UPGRADATION

Course Title	Skill Upgradation	Course Code	EE-411
Semester	III	Course Group	Core
Teaching Scheme in periods (L : T :P)	0:0:8	Credits	2.5
Methodology	Activities	Total Contact Periods	120
CIE	Rubrics	SEE	Nil

Suggested Course Outcomes

CO.1 Address the identified needs of the community collaboratively to facilitate positive social change.

a. Prepare a chart related to the topics covered in the present semester.
b. Listen to expert talk, guest lecture, youtube video and write a summary.
c. Participate in Haritha Haram and submit a small report about the activities.
d. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
e. Seminar on problems with possible solutions in the campus or nearby places
f. Group discussions or enacting a play on topics creating awareness about socio-economic problems
g. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
h. Participate in NCC

(PO5, 6, 7)

CO.2 Listen attentively to others and respond appropriately

a. Listen to expert talk, guest lecture, youtube video and write a summary.
b. Participating in Group discussions or enacting a play on topics creating awareness about socio-economic problems that can be mitigated by technologies.
c. Participate in quiz on technical aspects or current affairs
d. Participate in Mock Interview

(PO5, 7)

CO.3 Adapt your style to the occasion, task, and audience

a. Group discussions or enacting a play on topics creating awareness about socio-economic problems that can be mitigated by technologies.
b. Seminar on problems with possible solutions in the campus or nearby places
c. Participate in Mock Interview

(PO5, 6, 7)

CO.4 **Articulate ideas in various formats including oral, written, nonverbal, visual, and electronic devices.**

a. Prepare a chart related to the topics covered in the present semester.
b. Refer to an e-journal and submit a summary report on upcoming technologies.
c. Visit factory / industry and submit a report/PPT on the observations made.
d. Prepare a mini project and submit report.
e. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
f. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
g. Seminar on problems with possible solutions in the campus or nearby places
h. Participate in Mock Interview

(PO5, 6, 7)

CO.5 **Demonstrate ability to recognize and effectively manage ambiguous ideas, experiences and situations**

a. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
b. Seminar on problems with possible solutions in the campus or nearby places

(PO5, 6, 7,)

CO.6 **Analyze the interconnections between individuals and society as well as how individual actions have an impact on others.**

a. Participate in Haritha Haram and submit a small report about the activities.
b. Participate in Swatch Bharath and write an essay on the importance of the program
c. Participate in NCC

(PO5, 6, 7)

CO.7 **Utilize others' ideas, strengths, knowledge, and abilities to foster an inclusive environment & Develop and sustain healthy and meaningful relationships with others**

a. Prepare a mini project and submit report.
b. Participate in Haritha Haram and submit a small report about the activities.
c. Participate in Swatch Bharath and write an essay on the importance of the program
d. Participate in NCC

(PO5, 6, 7)

CO.8 **Ability to recognize their strengths and those of others to work towards a shared vision.**

a. Prepare a mini project and submit report.
b. Participate in Haritha Haram and submit a small report about the activities.
c. Participate in Swatch Bharath and write an essay on the importance of the program
d. Participate in NCC

(PO5, 6, 7)

CO.9 **Act in alignment with one's own values to contribute to one's life-long growth and learning.**

a. Physical activities such as sports, yoga, meditation and other relaxation techniques

(PO5, 6, 7, 8, 9, 10)

CO.10 **Gain, process, and act upon knowledge regarding the effects of individual, community, national, and international level choices on ecosystems and people.**

a. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
b. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
c. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
d. Seminar on problems with possible solutions in the campus or nearby places

(PO5, 6, 7)

CO	Outcome	CO/PO Mapping
CO1	Address the identified needs of the community collaboratively to facilitate positive social change.	5, 6, 7
CO2	Listen attentively to others and respond appropriately	5, 6, 7
CO3	Adapt your style to the occasion, task, and audience	5, 6, 7
CO4	Articulate ideas in various formats including oral, written, nonverbal, visual, and electronic devices.	5, 6, 7
CO5	Demonstrate ability to recognize and effectively manage ambiguous ideas, experiences and situations	5, 6, 7
CO6	Analyze the interconnections between individuals and society as well as how individual actions have an impact on others.	5, 6, 7
CO7	Utilize others' ideas, strengths, knowledge, and abilities to foster an inclusive environment & Develop and sustain healthy and meaningful relationships with others	5, 6, 7
CO8	Ability to recognize their strengths and those of others to work towards a shared vision	5, 6, 7
CO9	Act in alignment with one's own values to contribute to one's life-long growth and learning.	5, 6, 7
CO10	Gain, process, and act upon knowledge regarding the effects of individual, community, national, and international level choices on ecosystems and people.	5, 6, 7

Note: The above COs may map to other POs from 1 to 4 apart from PO's 5 to 10 depending on the topic

Suggested Student Activities

1. Prepare a chart related to the topics covered in the present semester.
2. Refer to an e-journal and submit a summary report on upcoming technologies.
3. Visit factory / industry and submit a report/PPT on the observations made.
4. Prepare a mini project and submit report.
5. Listen to expert talk, guest lecture, youtube video and write a summary.
6. Participate in Haritha Haram and submit a small report about the activities.
7. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
8. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
9. Participate in Swatch Bharath and write an essay on the importance of the program
10. Group discussions or enacting a play on topics creating awareness about socio-economic problems
11. Physical activities such as sports, games, yoga, meditation and other relaxation techniques
12. Participate in quiz on technical aspects or current affairs
13. Seminar on problems with possible solutions in the campus or nearby places
14. Participate in NCC
15. Participate in Mock interviews

Note: The above student activities will be assessed using rubrics. A sample rubrics template is given below. The subject teacher can assess students using rubrics with atleast four relevant aspects.

RUBRICS MODEL (For assessing Presentation skills)

Aspects	Needs improvement	Satisfactory	Good	Exemplary
Collection of data	Collects very limited information	Collect much Information with very limited relevance to the topic	Collects some basic information with little bit of irrelevance	Collects a great deal of information with relevance
Presentation of data	Clumsy presentation of data	Presents data well; but presentation needs to be more meaningful	Presents data well but need to improve clarity	Presents data in an understandable yet concise manner
Fulfill team's roles & duties	Performs very little duties but Unreliable.	Performs very little duties and is inactive	Performs nearly all duties	Performs all duties of assigned team roles
Shares work equally	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded
Interaction with other team mates	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening to others	Listens, but sometimes talks too much	Listens and speaks a fair amount
Audibility and clarity in speech	Hardly audible and unclear	Very little audibility and clarity	Audible most of the time with clarity	Audible and clear
Understanding content	Lacks content understanding and is clearly a work in progress	Little depth of content understanding	Some depth of content understanding is evident but needs improvement	Insight and depth of content understanding are evident
Content Presentation	Content is inaccurate and information is not presented in a logical order making it difficult to follow	Content is accurate and information is not presented in a logical order making it difficult to follow	Content is accurate but some information is not presented in a logical order but is still generally easy to follow	Content is accurate and information is presented in a logical order

Suggested additional aspects for assessing Leadership Qualities:

1. Carrying self
2. Punctuality
3. Team work abilities
4. Moral values
5. Communication skills
6. Ensures the work is done in time

Suggested additional aspects for assessing "Participation in social task"

1 Interested to know the current situation of society.
2 Shows interest to participate in given social task.
3 Reliable
4 Helping nature
5 Inter personal skills
6 Ensures task is completed

Suggested additional aspects for assessing "Participation in Technical task"

1. Updated to new technologies
2. Identifies problems in society that can be solved using technology
3. Interested to participate in finding possible technical solutions to identified project
4. Reliable
5. Interpersonal skills

Suggested additional aspects for carrying Self:

1 Stand or sit straight.
2 Keep your head level.
3 Relax your shoulders.
4 Spread your weight evenly on both legs.
5 If sitting, keep your elbows on the arms of your chair, rather than tightly against your sides.
6 Make appropriate eye contact while communicating.
7 Lower the pitch of your voice.
8 Speak more clearly.